FLYING

including INDUSTRIAL AVIATION

VOLUME XXXII NUMBER 2

U. S. NAVAL AVIATION AT WAR

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FEBRUARY, 1943

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General Manager

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Managing Editor

DON RYAN MOCKLER
Associate Editor

HERMAN R. BOLLIN
Art Director

GEORGE BERNER
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ZIFF-DAVIS PUBLISHING COMPANY
Editorial Offices: 540 N. Michigan Ave., Chicago, Ill.
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FLYING is published monthly by Ziff-Davis Publishing Company at 540 N. Michigan Ave., Chicago, Ill. New York Advertising Office, 270 Madison Ave. West Coast Advertising Representative, William L. Pinney, 416 W. Eighth St., Los Angeles, Cal. Canadian Advertising Representative, G. J. McGoey, 21 King Street, East, Toronto. London Advertising Representative, J. Forecast, Edwin Greenwood, Ltd., 231 Strand, London W.C.2. Washington Bureau, Occidental Hotel, Lieut. Col. Harold E. Hartney, Manager. SUBSCRIPTION RATES: In U. S., $3.00 per year, single copies 25 cents; in South and Central America and U. S. Possessions, $3.00 per year; in Canada, $3.50 per year, single copies 30 cents; in British Empire, $4.00 per year. All other foreign countries, $6.00 per year. Subscribers should allow two weeks for change of address. Address all subscription letters to the Director of Circulation, FLYING, 540 N. Michigan Ave., Chicago. Entered as second class matter, September 8, 1942, at the Post Office, Chicago, Illinois, under the act of March 3, 1879. Entered as second class matter at the Post Office Department, Ottawa, Canada. Contributors should retain copy of contributions. All submitted material must contain return postage. Contributions will be handled with reasonable care, but this magazine assumes no responsibility for their safety. Accepted material is subject to whatever adaptations and revisions are necessary to meet requirements. Payment covers all authors', contributors' and contestants' rights, title, and interest in and to the material accepted and will be made at our current rates upon acceptance. All photos and drawings will be considered as part of material purchased.

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TRAINING! *the most important thing.....* FIRST

Today's rush production schedules and maintenance of the tremendous number of planes demanded by President Roosevelt has brought out the vital fact: TRAINING is the most important thing FIRST. As a result this has brought about the employment and enlistment by the armed forces of thousands of men who can meet the minimum requirements, by short "quickie courses." BUT, only men with MAXIMUM training can hope to win advancement to responsible and well paid positions either in civil or military aviation. BE FAR SIGHTED . . . . the future holds more than war, with the inevitable readjustment to post war conditions. The Aviation Industry cannot hope to retain all the number of workers demanded by the present emergency. When the war is over, as it eventually must be, the only way you can assure yourself of a career and occupy a vital supervisory position, with the assurance of a future in aviation, is to train NOW.

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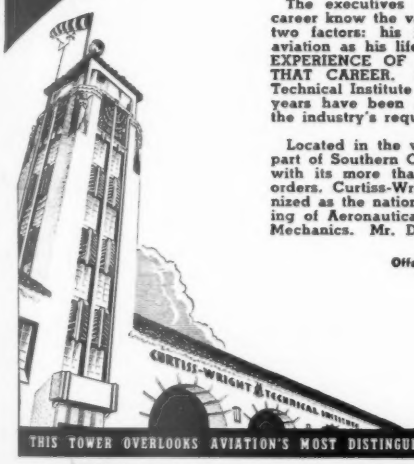

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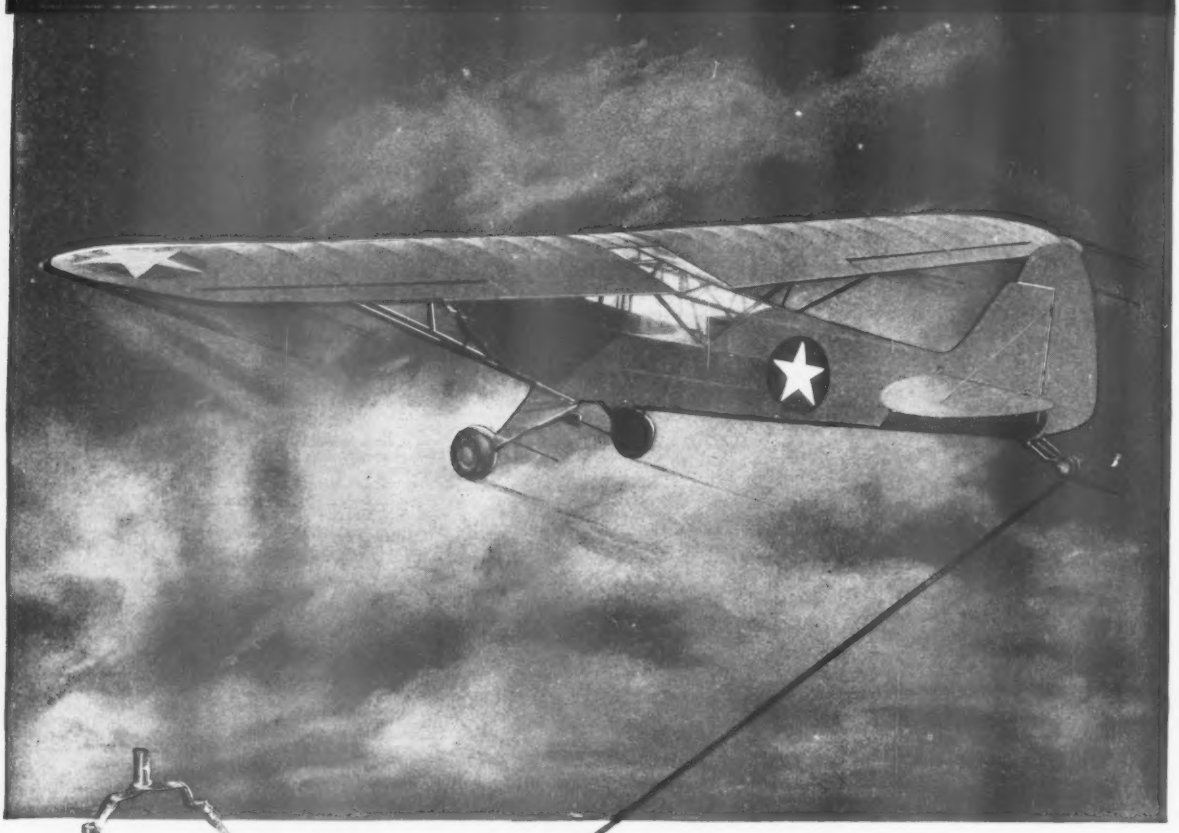

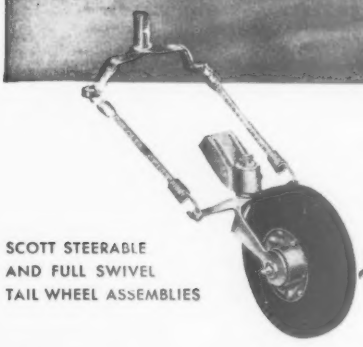

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Fulfilling their important missions with versatility and dispatch, Piper Liaison planes depend on Scott Tail Wheel Assemblies to "bring up the rear"—and set them down, too—with unfailing performance.

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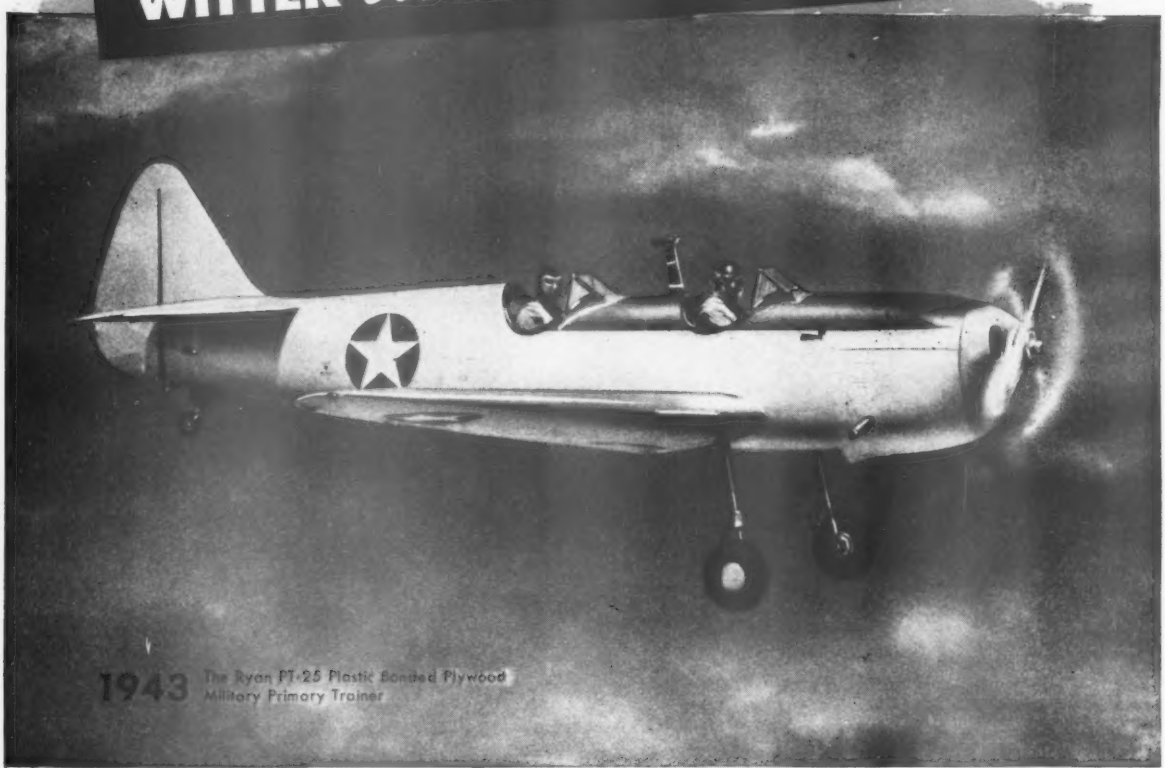

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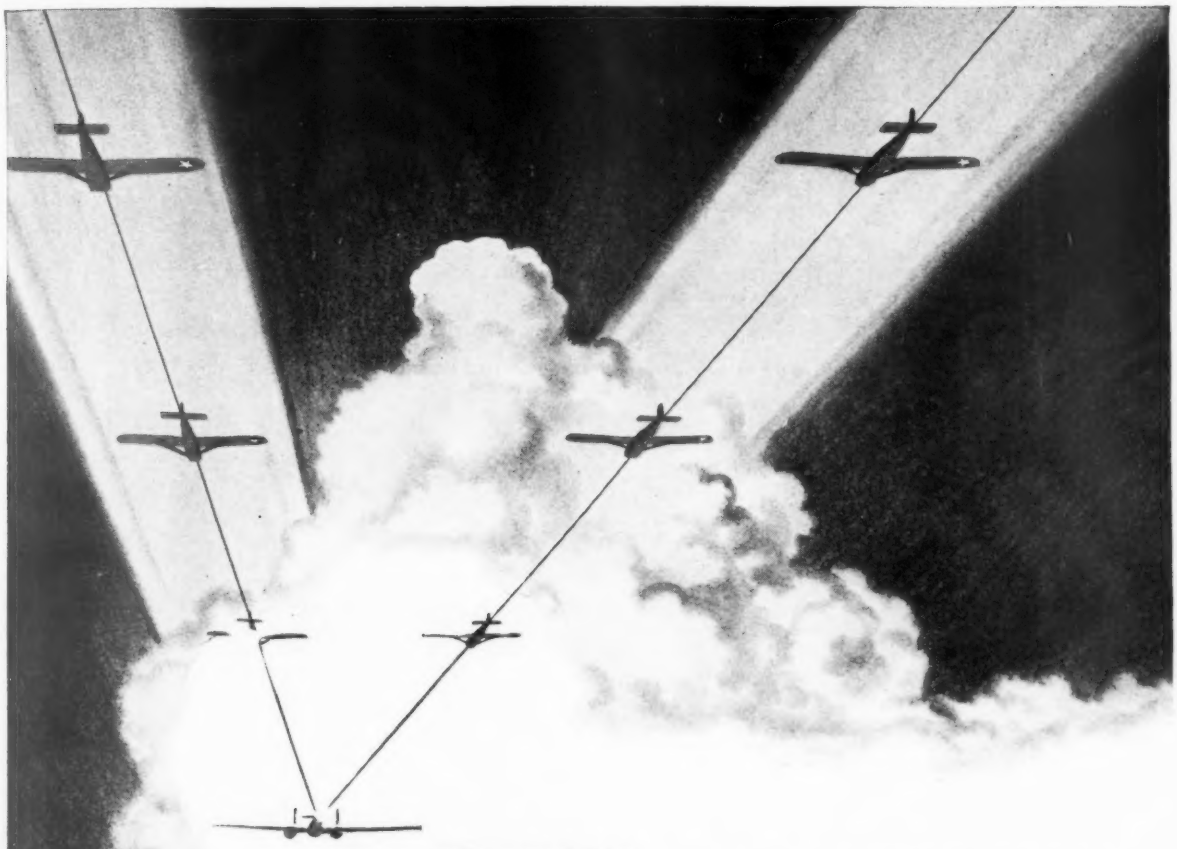

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Speed and mobility . . . moving men, guns, equipment and supplies anywhere they're needed, *quickly.* Carrying armed forces to a strategic point, *fast.* Hopping over a terrain that would be slow and tedious work by the ordinary means of transportation. Delivering crack troops to the point of contact without submitting them to the hazards of ground travel . . . this is the job the glider units will tackle to put the "V" in Victory . . . assure America a new freedom—*freedom of the air.*

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So we're going to tell you more about them this year. Over on the other side of the page there, you'll see the first of our monthly stories on Gulf *non*-aviation products which are just as essential to warfare as high-octane Gulf Aviation Products.

Major Al Williams,

alias, "Tattered Wing Tips," Gulf Aviation Products Manager, Gulf Bldg., Pittsburgh, Pa.

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ME AND AL ARE PAYING FOR THESE GUNS WITH OUR WAR BONDS.

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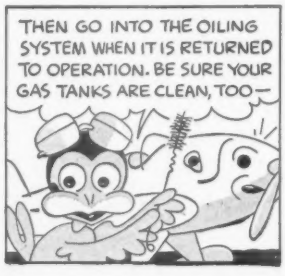

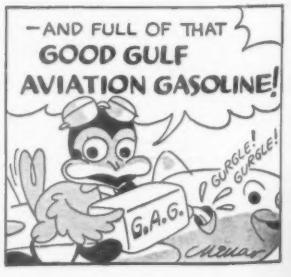

LOCKED IN THE MATERIAL

INNER TEETH OF RING ENGAGE TEETH OF COLLAR. OUTER TEETH BROACH INTO MATERIAL *and lock stud*

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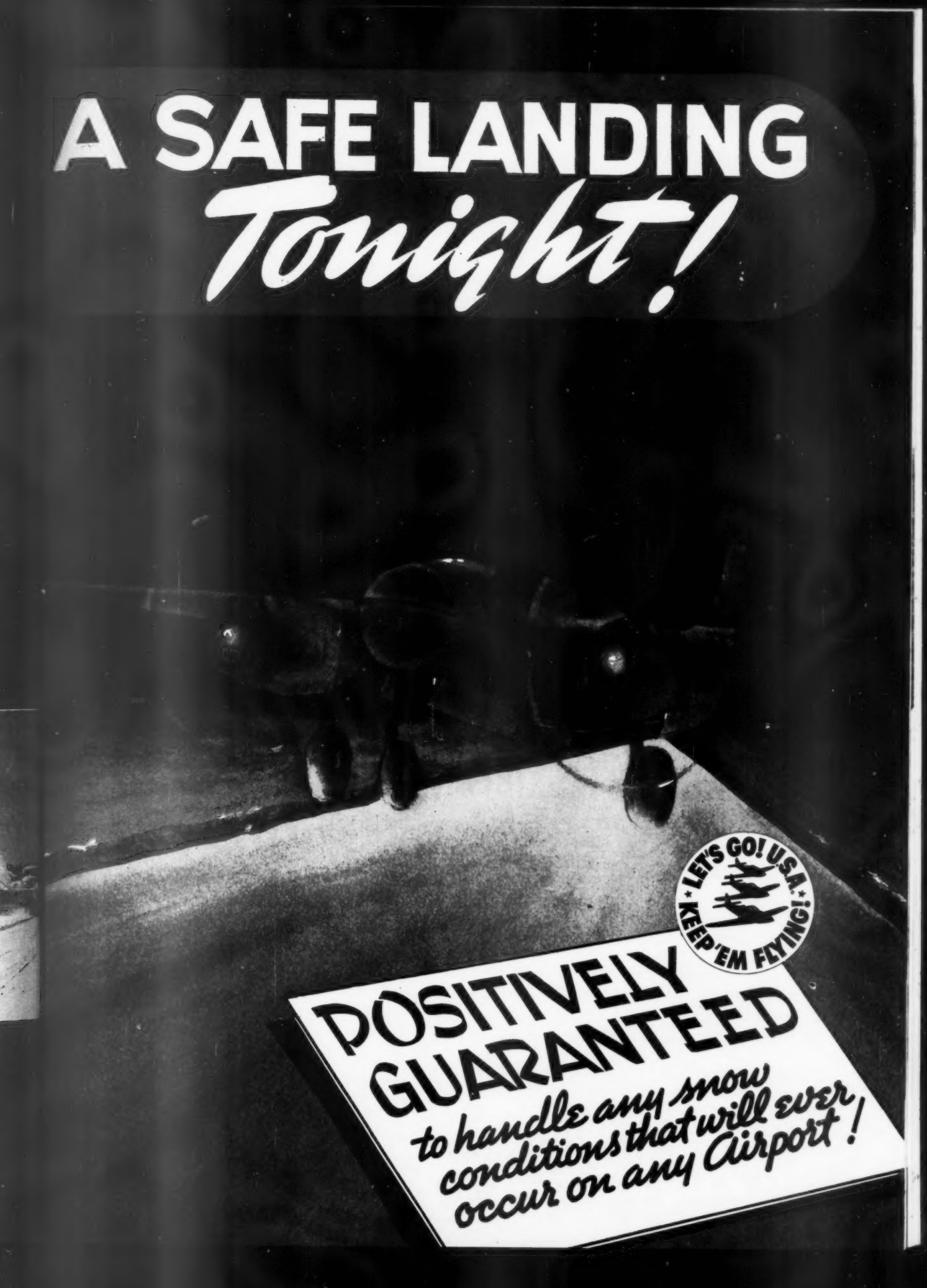
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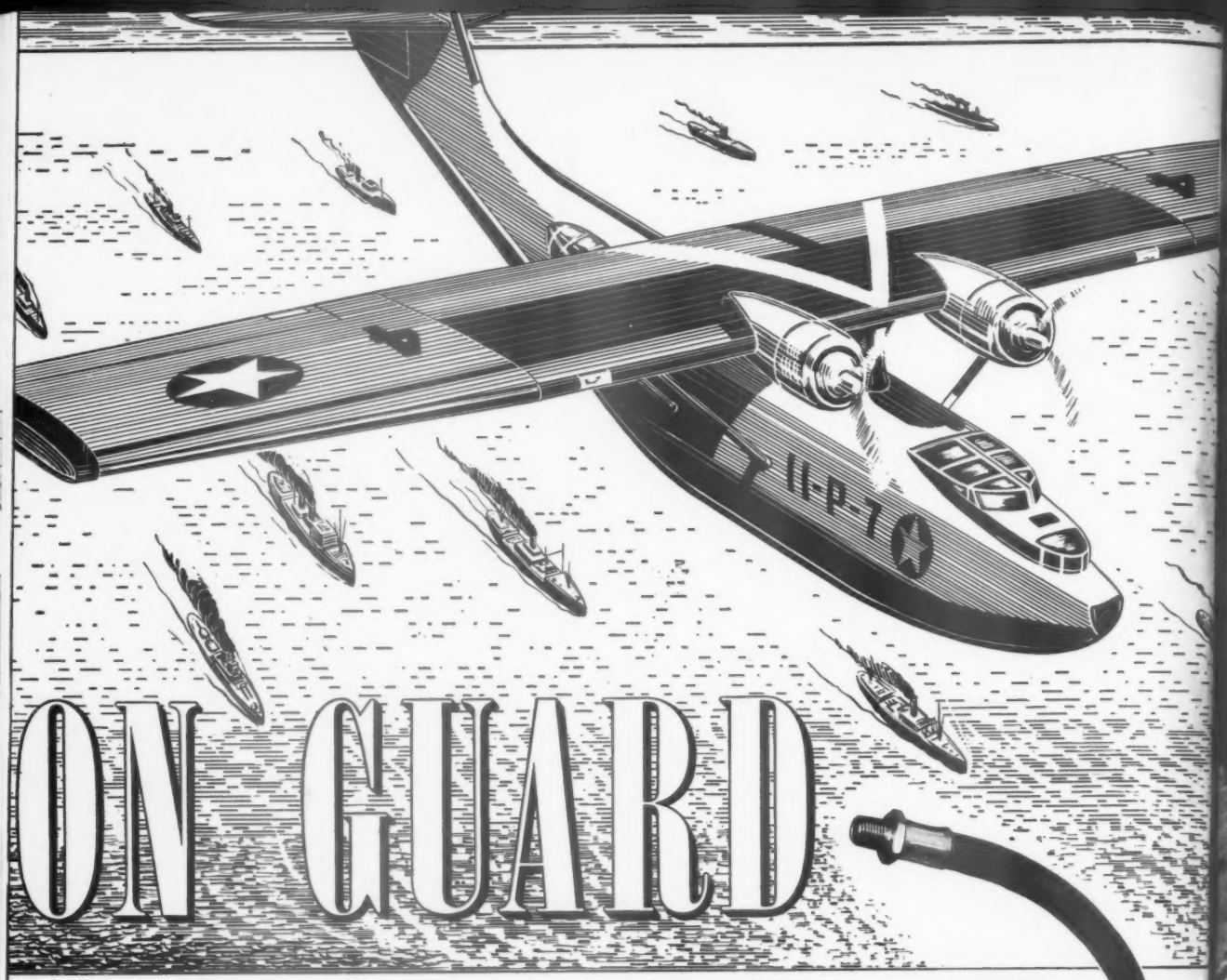
conditions that will ever
occur on any Airport!



against Vibration, Varying Pressures and Extreme Temperature Changes

WEATHERHEAD FLEXIBLE HOSE

BUILT to meet the toughest service demands, Weatherhead High, Medium, and Low Pressure Flexible Hydraulic Hose assemblies keep hydraulic forces flowing to vital mechanisms on every type of military and commercial plane.

Withstanding heat, cold, vibration, strain, and varying pulsations of pressure, Weatherhead assemblies are used for fuel lines, oil lines, instrument lines, and hydraulic applications of all kinds.

Prime contracts with the Army, Navy, Marines, and Coast Guard are evidence of the reliability of Weatherhead.

Other Weatherhead airplane accessories include Dural Tube and Pipe Fittings; Vacuum Selector and Check Valves; Hydraulic Check Valves; and Hydraulic Actuating Cylinders. All are manufactured to Air Corps, Navy, or "AN" specifications.

★ **THE WEATHERHEAD CO.**, *Main Office:* **Cleveland, Ohio** ★

Branch Offices — Detroit, Los Angeles, New York, St. Louis

WEATHERHEAD

THE margin between victory and defeat in these breathless days of highly mechanized warfare can be decided by the performance of a single piece of equipment. As in the great battle of the Coral Sea, one brief radio message . . . *and thus the aircraft transmitter which puts it through* . . . may alone stand between the nation and possible disaster.

Creating equipment for such vital service is more than a responsibility. It is a glorious privilege. You can see this clearly on the faces and in the craftsmanship of the men and women on every shift in each Airaco factory. They are *in* this war, not on the sidelines. From *their* hands this very day may come the one instrument by which some hero will start the action to be forever known as the most important Victory in the entire history of mankind. Aircraft Accessories Corporation

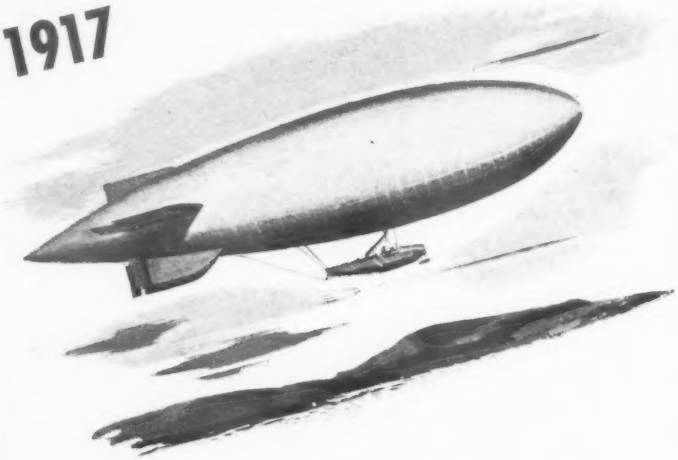
Burbank, Calif; Kansas City, Kan.; New York, N. Y.; Dayton, Ohio; Chicago, Ill.; Slater, Mo.

AIRCRAFT ACCESSORIES CORPORATION

Hydraulic Aircraft Controls ★ ★ ★ *Precision Radio Equipment*

Trail Blazing in the Skies

1917



THE FIRST SUCCESSFUL NON-RIGID AIRSHIP ever used by the United States Navy was built by Goodyear in 1917. Before the close of World War I a considerable fleet was in active service in anti-submarine patrol duty and proved highly effective. After the war Goodyear continued further to develop and improve airships by building and operating its own squadron.

HOW GOODYEAR AIRCRAFT CORPORATION SERVES THE AIRPLANE INDUSTRY

1. *By building parts to manufacturers' specifications.*

2. *By designing parts for all types of planes.*

3. *By re-engineering parts for mass production.*

4. *By extending our research facilities to aid the solution of any design or construction problem.*

1943

TODAY THE LARGEST NON-RIGID AIRSHIPS EVER BUILT are being produced by Goodyear for the Navy. Many are already in service along our coasts. These new ships have far greater range than their 1917 predecessors; carry a heavier bomb load and can stay aloft for days, if necessary. The ability to deliver these patrol ships rapidly and in quantity results from Goodyear's long pioneering in aeronautics.

GOODYEAR

GOODYEAR AIRCRAFT

D2313
The
de HAVILLAND MOSQUITO
Fastest Bomber in the World

Immediate Conversion TO Speed Nuts

. . . to meet your production schedules!

Immediate conversion to SPEED NUTS for non-structural attachments will help you meet your production schedules ON TIME. SPEED NUTS are approved by the U. S. Army Air Forces and the Bureau of Aeronautics for non-structural attachments on military aircraft. This provides a new source of approved self-locking nuts to relieve the present shortage.

Our Engineering Dept. will be glad to assist you in determining the proper approved locations where Speed Nuts may be used. Request for information or assistance will receive immediate attention.

TINNERMAN PRODUCTS, INC. • 2086 FULTON ROAD, CLEVELAND, OHIO

IN CANADA: Wallace Barnes Co., Ltd., Hamilton, Ontario.

IN ENGLAND: Simmonds Aerocessories, Ltd., London

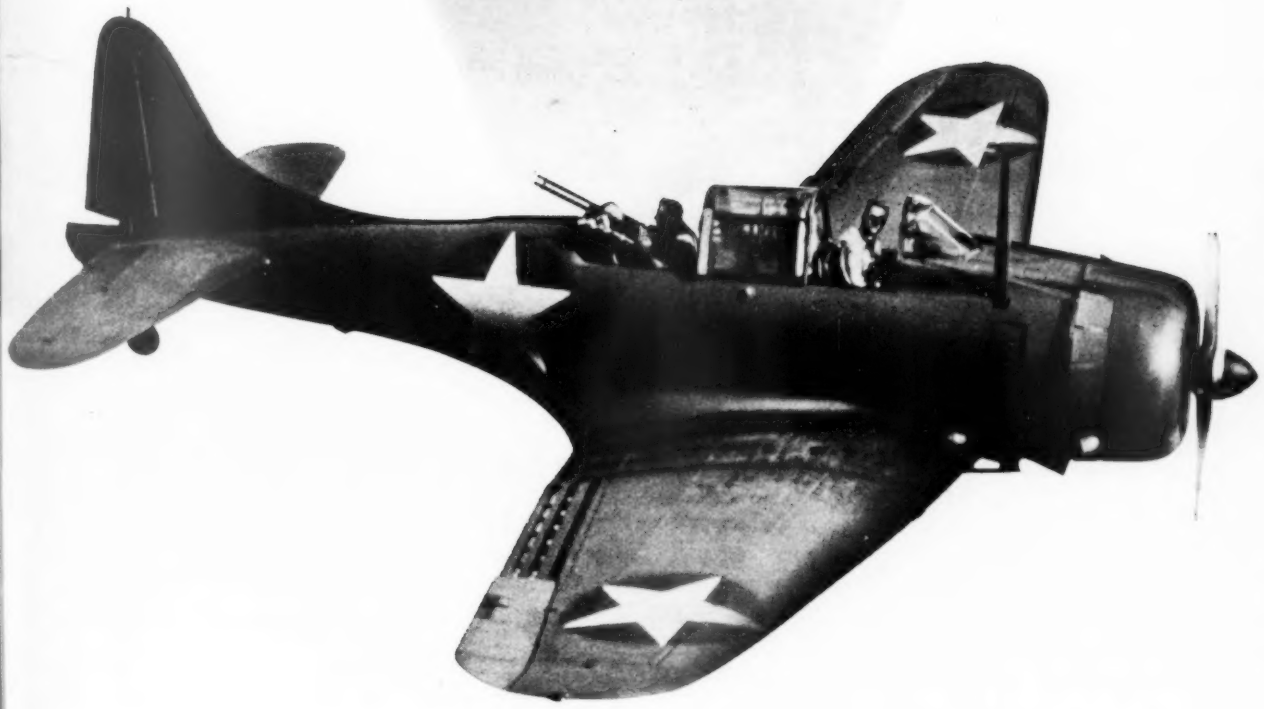
Speed Nut System

HE FASTEST THING IN FASTENINGS

DOUGLAS

Dauntless

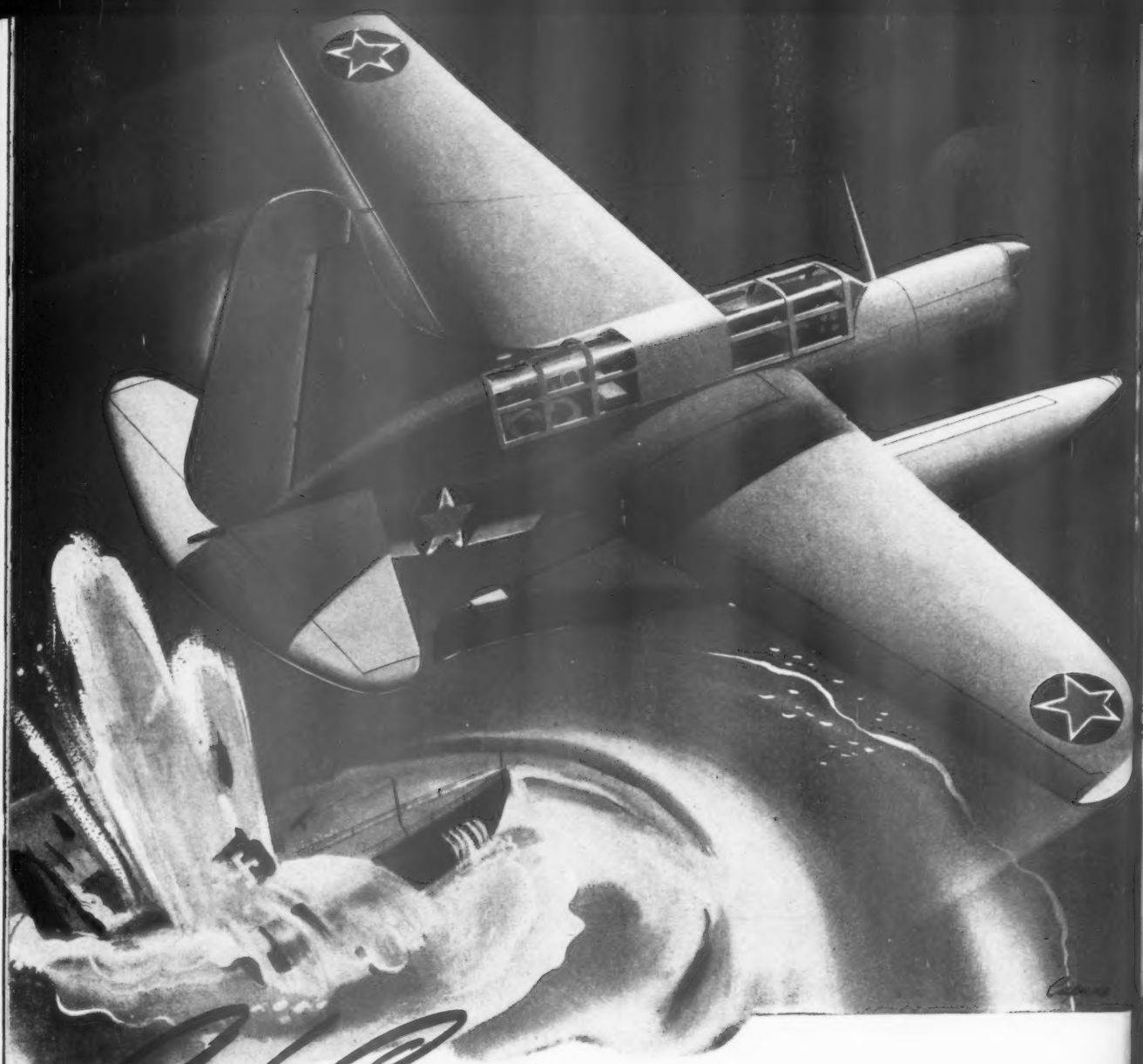
THE WORLD'S HARDEST
HITTING DIVE BOMBER
IN U.S. NAVY SERVICE



Douglas

(1) C-54 "Skymaster" (2) C-47 "Skytrain," C-53 "Skytrooper" (3) A-20 "Boston," A-20 "Havoc" (4) SBD "Dauntless," TBD "Devastator," A-24 "Banshee"

DOUGLAS AIRCRAFT COMPANY, INC.
SANTA MONICA, CALIFORNIA
MEMBER, AIRCRAFT WAR PRODUCTION COUNCIL, INC.



Ash Cans FROM THE BLUE!

Marauding Axis undersea craft will soon suffer devastating "Ash Cans from the Blue," planted with unerring accuracy by Ryan-built Navy scout observation planes.

Navy Pilots are proving daily that the potent "ash can" depth charge of surface Destroyers is even more effective from the sky. With new type scout-observation planes they are extending still farther the vast ocean expanses which can be scanned—and protected—by the "eyes of the fleet."

Ryan's contract to produce impressive numbers of SOR-1s for our Navy and the United Nations is but one of many important war assignments, being speeded by thousands of skilled hands at the Ryan plant in San Diego—one of America's most modern military aircraft factories.

RYAN AERONAUTICAL COMPANY, SAN DIEGO, CALIF.

Member, Aircraft War Production Council, Inc.

★ *Secure Your Share of Tomorrow*
With the War Bonds You Buy Today

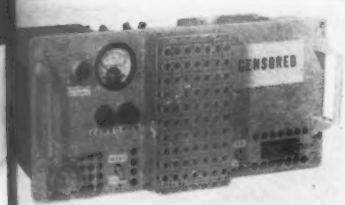
RELY ON Ryan
A NAME OF MILITARY SIGNIFICANCE

WE'RE KEEPING "Tough" COMPANY

. . . and we're PROUD of it!

Designed for Operating Portable Test Equipment in the Field

Input Voltage: 12 Volts
Output: 110 AC, 180 Cycles
Wattage Capacity: 30 Watts
Size: 4" x 4" x 6"
Weight: 3 lbs.
Efficiency: 75%



Tough Problem—But Electronic Licked It!

Input: 12 Volts DC or 110 Volts AC.
Output: 2000 Volts DC at 200 Ma.
450 Volts DC at 70 Ma.
+250 Volts at 30 Ma.
−250 Volts at 25 Ma.
10 Volts AC 7 Amperes
Approximate output wattage, 500 watts
Weight: 56 lbs. Size: 19" x 11" x 8"
Efficiency: 65%
Regulation: 13%
Designed for continuous operation at full load

IN RETURNING TO ACTION, after recent refitting, *H.M.S. Illustrious* relies on newly installed ELECTRONIC equipment . . . not only for herself but for the planes that fly from her decks. Tough company? Yes! *Magnificently so!* But only *one* of *many* rugged military assignments for Electronic: Tanks! Walkie-Talkies! Mobile Amplifiers! Jeeps! P-T Boats! *Not a "softie" in the lot!*

BECAUSE IT TAKES TOUGH PRODUCTS to keep tough company, Electronic is justly proud of her wartime role. And *tomorrow* Electronic Power Supplies will return to peacetime pursuits . . . at *your* service . . . *tougher* and *better* in every way because of their combat experience. Until then . . . CARRY ON!

Electronic LABORATORIES, INC.

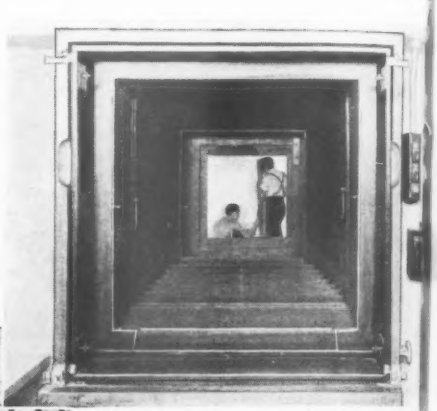
INDIANAPOLIS

These Martin Firsts help make

U.S. AIRCRAFT

SECOND TO NONE!

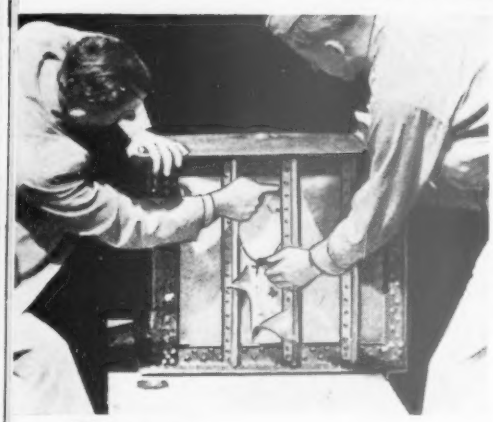
FIRST all-plastic aircraft nose, used on the Martin B-26, giving bombardier full visibility and absorbing recoil of forward gun. Martin was working on plastic noses and other parts as far back as 1921. Today some Martin types contain 400 plastic parts.



FIRST to develop photo-layout method, utilizing giant camera. Through this method, scale photos are reproduced directly on sheet metal, thus speeding production. Moreover, drawings may be scaled up or down swiftly, accurately.

FIRST to develop "heat therapy" for airplane wings. A giant heating "pad" is applied to aluminum covering of wing, expanding this "skin." Riveted when hot, skin shrinks when cool, fits tightly over spars without wrinkling or buckling.

FIRST U. S. power-operated gun turrets, giving our bombers strong protection against enemy interceptors. Martin manufactures these turrets not only for Martin bombers but also for many other types of American aircraft.



FIRST U. S. self-sealing fuel tank. Martin Mareng tanks are now standard equipment on many American aircraft. Martin experiments on self-sealing fuel tanks date from 1919, during which period over 285 different materials were tested.

These are only a few Martin "firsts." Some are still close-guarded military developments, while numerous others, individually minor but collectively important, are in use throughout the aviation industry. But Martin engineers are never satisfied. In scores of diverse fields, work goes on to give America even mightier planes for today's aerial fights, tomorrow's peacetime flights.

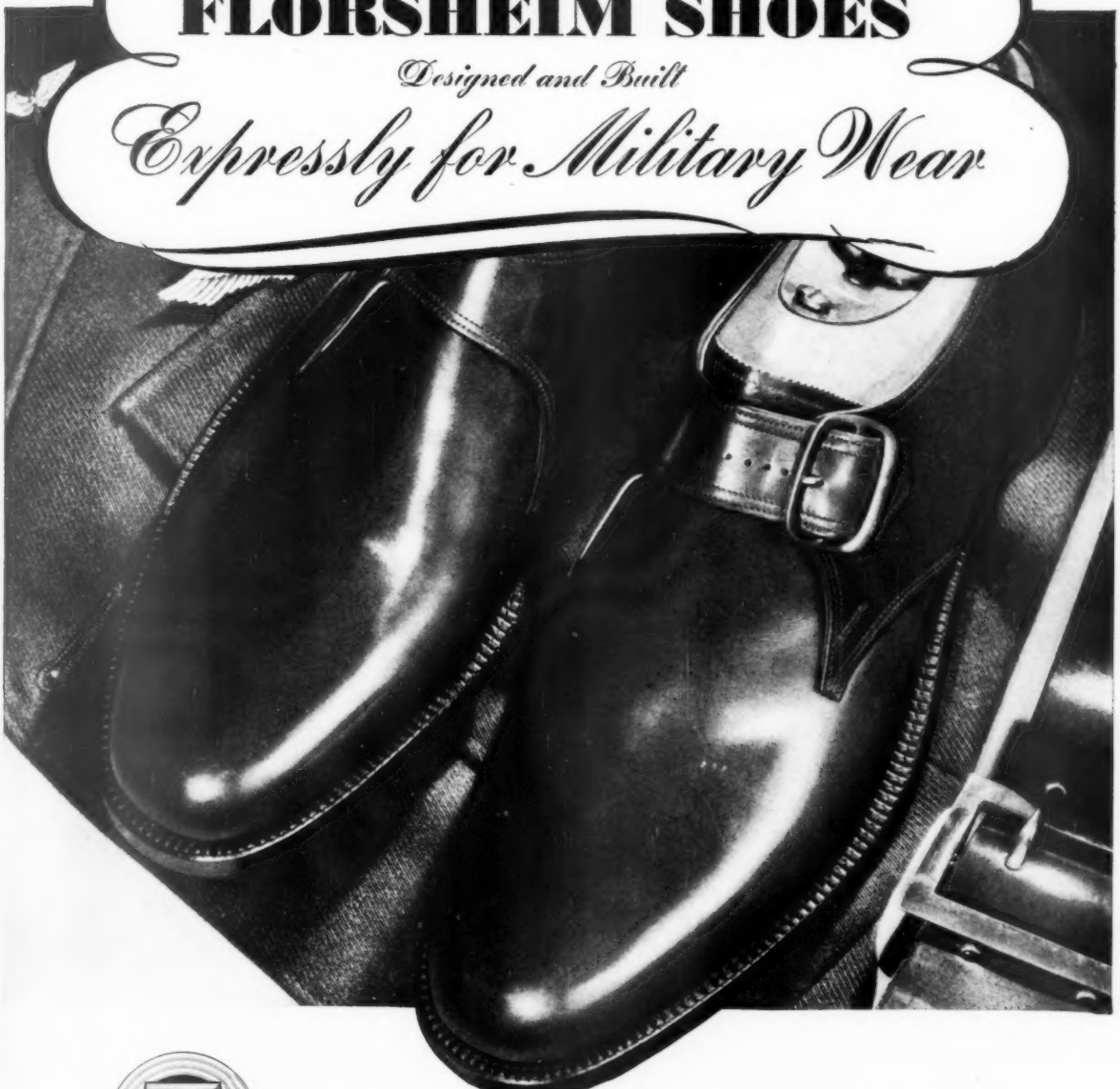
Martin
AIRCRAFT

Builders of Dependable Aircraft Since 1909

FLORSHEIM SHOES

Designed and Built

Expressly for Military Wear



The FLORSHEIM Shoe

We made them at the request of thousands of reserve officers, who were accustomed to the superior fit, comfort, and wear of Florsheim civilian styles. When called up for active duty, they helped us design a special last to meet all Military specifications: straight inside line; extended rubber heel; arch-cradling shank, and seamless, chafeless quarter-linings. This last is now reserved exclusively for Florsheim Military Styles . . . the shoes worn today by more Army, Navy, Marine, Air Corps, and Coast Guard officers than any other Quality line! *Military Style illustrated above,* $11.

WRITE FOR THE ADDRESS OF YOUR NEAREST FLORSHEIM DEALER OR STORE

THE FLORSHEIM SHOE COMPANY • CHICAGO • *Manufacturers of Fine Shoes for Men and Women*

Task Force . . . On any front, no flight group will take off with better assurance of getting there first than the elite pilots selected to fly *Republic P-47 Thunderbolts*, the only airplanes known to have been propelled through space at the almost incredible diving speed of 12 MILES PER MINUTE!

REPUBLIC AVIATION

REPUBLIC AVIATION CORPORATION REPUBLIC AVIATION FARMINGDALE, L. I., NEW YORK

I want to preach a sermon...

I have no explanation for turning this family pew into a pulpit, except, just now, the spirit moved me.
With your permission, I want to say what others, later on, may say better, but what I feel *must* be said now!

* * *

The time I lost my job we ate beans six weeks in a row.
But I got back on a payroll!
The day the banks closed, I felt like I'd been hit with a ton of bricks.
But I got up and dusted my pants off!
The year I worked my fingers to the bone, and took a cut instead of a raise, I swore I'd quit.
But I stuck!
The night we got the telegram about our boy, we thought the sun would never shine again.
But . . . we're carrying on!

* * *

It seems to me, somebody's got America sized up wrong.
This country was born at Valley Forge!
This country outgrew the grief of Gettysburg!
This country came to manhood at the Marne, and in the shattered forest of the Argonne!
The point I want to make is . . .
We've been through the hardships and the heartaches all before!

Our only trouble is that when it comes to making war, we're a little short of practice.
But what we haven't any shortage in, is courage . . . fighting spirit . . . and the will to win!
That's why we want to know the truth about this war,
The whole truth and nothing but the truth, plain . . . unvarnished . . . with the bark on!
That way we all can figure out how big the job is and buckle down to lick it.
So, let's have it!
If we need sugar to win this war, take it.
If we need rubber to win this war, take it.
If we need steel to win this war, take it.
If we need cash to win this war, take our money and buy War Savings Stamps and Bonds!
Take everything we've got to win this war, and welcome!
Because there's one thing no one's ever going to take from you and me, so help us God,
And that's America!

* * *

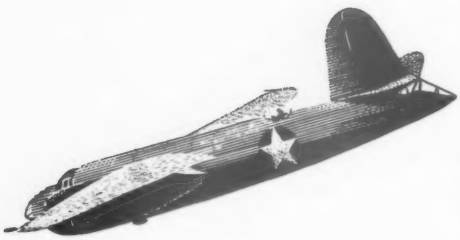
I'm not talking for myself alone, or for my family.
I'm talking for *all* Americans.
So, the words could just as well be yours as mine.
And I say: We'll live on bread and water, if we have to,
And we'll like it . . . fine!

UNITED STATES RUBBER COMPANY
ROCKEFELLER CENTER • NEW YORK CITY

AN IMPORTANT NAME *in Aviation*

WHEN the war suddenly placed its staggering load on America's aviation industry, the Houdaille-Hershey Corporation had long been in a strong, able position to lend a hand.

We had the experience, the plants—*ten* of them—the machinery and the organization of skilled men to offer assistance on a major scale.



For a number of years, we had been making special hydraulic equipment and other precision parts for aircraft manufacturers. The war increased this phase of our business a thousand-fold—an increase which was readily attained because of the extent of our facilities.

Fortunately, too, we are engineers and metallurgists as well as manufacturers, so that we have helped to speed up the solution of many details in the design and construction of aircraft.

Thus Houdaille-Hershey has become an important ally of the aviation industry—and one which promises to make ever-increasing contributions to its future.

BUFFALO ARMS CORPORATION
Buffalo, N. Y.

GENERAL SPRING BUMPER DIVISION
Detroit, Mich., and Chicago, Ill.

HOUDE ENGINEERING DIVISION
Buffalo, N. Y.

JACKSON BUMPER DIVISION
Jackson, Mich.

JACKSON CRANKSHAFT DIVISION
OF MUSKEGON MOTOR SPECIALTIES CO.
Jackson, Mich.

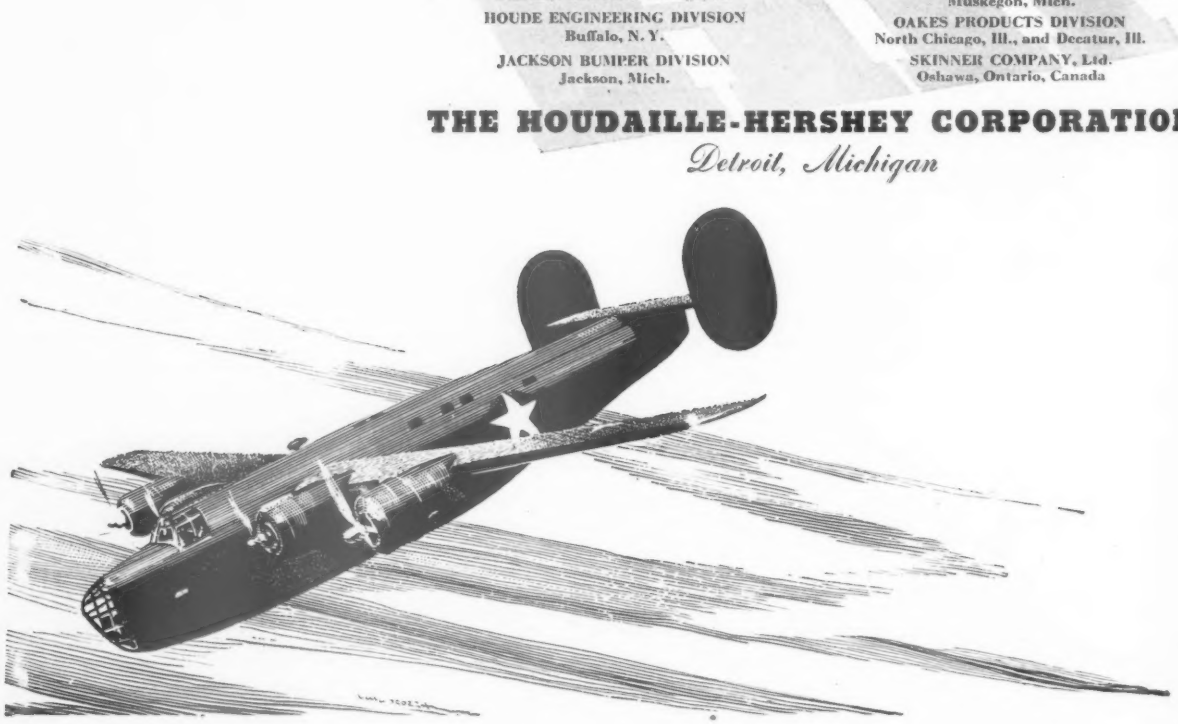
MUSKEGON MOTOR SPECIALTIES CO.
Muskegon, Mich.

OAKES PRODUCTS DIVISION
North Chicago, Ill., and Decatur, Ill.

SKINNER COMPANY, Ltd.
Oshawa, Ontario, Canada

THE HOUDAILLE-HERSHEY CORPORATION

Detroit, Michigan



"I am a User of LEARADIO"

. . . says Major ALEXANDER P. de SEVERSKY

"Sometime before the radio compass was adopted generally," Major Alexander P. de Seversky writes us, "I had an experimental set with me during a flight to Mexico City. I was caught by bad weather and was forced to fly all the way through the overcast above 20,000 feet. Locating the airport and descending was a difficult problem. But Tschaikowsky's Symphony in F emanating from the local broadcasting station guided me faultlessly to the airport. I landed safely before a group of worried and astonished officials."

Other famous pilots who use Learadio in their planes are Clyde Pangborn, Major Al Williams, Colonel Roscoe Turner, and Bob Hall.

Earning its mark as the *"pilot's preference"*, Learadio is now standard equipment on the better known aircraft, including Grumman Amphibians, Wacos, Fairchilds, Cessnas, and most civilian and air cadet pilot training aircraft and itinerant types used in the service of the armed forces.

★ ★ ★

Automatic electrical and mechanical controls of Lear-origin are incorporated in the aircraft manufactured by: Consolidated, Vultee, North American, Douglas, Boeing, Lockheed, Beech, Curtiss-Wright, Grumman, Northrop, and the subcontractors: Ford, General Motors, Bellanca, Eastern, Nash-Kelvinator.

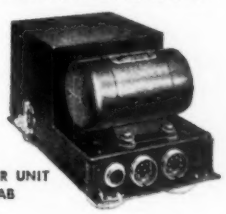
RECEIVER

T-30 RCDB transmitter-receiver is an extremely efficient and dependable 2-way aircraft communication system. It's the *"pilot's preference"* because every flying need has been foreseen and every installation problem solved in advance—everything is at the pilot's finger tips.

- ★ Powerful 2-frequency crystal controlled transmitter (2900 KC to 6500 KC).
- ★ Telephone and telegraph emission approx. 20 watts output.
- ★ Three Band receiver — radio ranges (180 KC to 405 KC) broadcast (500 KC to 1200 KC) airway communications (2800 KC to 6700 KC).

For "three-way radio", the receiver includes new provision for operating from both the conventional antennae and the famous lightweight Learadio loop *(shown below)* providing static-free reception or aural-null direction finding. *(Approved type for C. P. T. training).*

Write for Descriptive Literature
LEAR AVIA, Inc., Piqua, Ohio



POWER UNIT
G-30-AB

LEAR AVIA, INC.

BATTLE-BORN, BATTLE-TESTED, BATTLE PROVEN

Superior Instruments FOR TOMORROW'S FLYING

THE RESCUE OF RICKENBACKER

The Date:

November 13, 1942.

The Scene:

A choppy South Pacific sea, 600 miles north of Samoa.

Rescue Plane:

A Vought-Sikorsky "Kingfisher" scout-observation seaplane, equipped with Edo Float gear and piloted by W. F. Eadie, Lt., U.S.N.

Rescued after twenty-one days on a rubber life raft:

Capt. E. V. "Eddie" Rickenbacker, Col. Hans C. Adamson and Pvt. John F. Bartek.

Note:

After the rescue, the heavily overloaded 2-place seaplane withstood the gruelling test of taxiing 5 people to safety through 40 miles of choppy sea.

EDO AIRCRAFT CORPORATION
College Point
Long Island, N. Y., U. S. A.

POWER TO WIN

It takes power to attack . . . all-out, co-ordinated striking power of thoroughly trained fighting men and dependably powered war machines. For over forty years Continental has specialized in the production of power. Today the all-out facilities of the expanding Continental plants and the zealous teamwork of Continental workers are co-ordinated in the production of Continental Red Seal Engines that are in action on every front . . . including our farms, oil fields, and industry.

Your Dollars are Power, too — Buy War Bonds

ARMY E NAVY

Continental Motors Corporation
Aircraft Engine Division
MUSKEGON, MICHIGAN

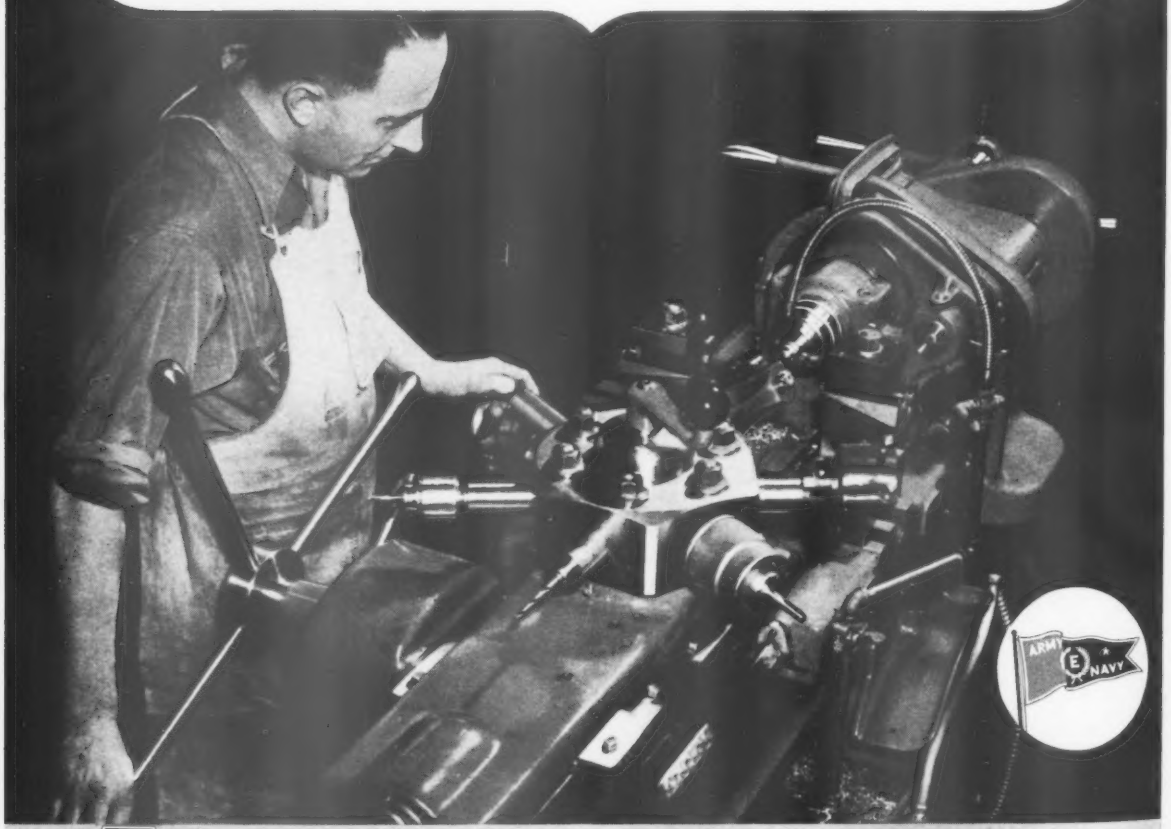
★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

KEEPING PRECISION IN PACE WITH PRODUCTION

War production is urgent—that's certain. Though quantities may be large and deliveries rush, production *without precision* is wasteful. Today, in hundreds of war production plants precision keeps pace with production through South Bend No. 2-H Turret Lathes.

Features responsible for the efficient performance of these Turret Lathes include an exceptionally rigid turret and carriage construction—a quick change gear box providing a wide range of power feeds for the universal carriage and turret—complete thread cutting range through lead screw and split nut, and a wide selection of spindle speeds.

The No. 2-H Turret Lathe has 16″ swing, 1⅜″ spindle hole, and 1″ collet capacity. South Bend Turret Lathes are also available in smaller sizes. Toolroom and Quick Change Gear Lathes are manufactured in 4 sizes, 9″ to 16″ swings. Write for information, specifying sizes and types of lathes in which you are interested.



SOUTH BEND LATHE WORKS

South Bend, Indiana — Lathe Builders For 36 Years

Protection!

• Kendall Oil has proved its ability to stand up under the terrific, punishing heat of today's war-plane engines. It has proved completely dependable when the going is toughest and oil failure would be fatal.

Only the finest oil can perform like this.

The extra quality of Kendall is the result of special refining applied to 100% Bradford, Pennsylvania crude, the choicest in the world. The refining includes two processes used by no other Pennsylvania refiner. Ask for Kendall, the 2000 Mile Oil. Available at most airports.

KENDALL
The
2000 MILE OIL

KENDALL REFINING COMPANY, BRADFORD, PENNA. · KENDALL REF. CO. OF CANADA LTD., TORONTO

★

MORE WINGS FOR THE EAGLE

Each fledgling eagle of America's fighting air forces must try his wings first in small planes and then in increasingly larger and faster planes to fully develop the skill and strength that's needed to leave the nest and seek the prey. Far along the road to becoming a full-fledged eagle, America's pilots learn to handle big, fast twin engine advanced trainers whose mastery gives full strength to the eagle's wings. The Globe Aircraft Corporation is truly proud of the part it is playing in producing the Globe AT-10-GL, twin engine advanced trainer for the air forces of democracy.

17-3

GLOBE

AIRCRAFT CORPORATION

A Texas Institution

READY FOR ACTION
AT 50,000 FEET!
UP, up, up . . . to 50,000 feet. And hairline accuracy every foot of the way!
The incredibly sensitive diaphragm of this newest Kollsman Sensitive Altimeter expands less than 15/64 of an inch between sea level and a nine-mile ceiling!
Yet this tiny movement—an average of only .00009 of an inch for each 20-ft. calibration—sends the large pointer around the dial 50 times for a lateral travel of more than 37 feet.
At lower altitudes, control of expansion is a relatively simple matter. But as the troposphere and stratosphere are reached, each 1,000 feet of climb multiplies rapidly the problem of precise barometric measurement and temperature compensation.
Such an instrument is the highest expression of Kollsman precision work and forward-looking policy to keep abreast of the finest military aircraft today . . . to build for the future when passengers, mail and cargo will be carried 50,000 feet in the sky.
KOLLSMAN
AIRCRAFT INSTRUMENTS
Product of
SQUARE D COMPANY
ELMHURST, NEW YORK • GLENDALE, CALIF.

Wherever the strategy of global warfare takes America's gallant pilots, they confidently rely on Aerols for perfect landings and take-offs.

Aided by Aerols, some of these men land the biggest bombers with effortless ease on the scorching sands of North Africa. Others, piloting the fiercest fighters, rely on Aerols for swift, sure take-offs on runways hacked out of the Australian bushland.

Because of their outstanding performance on every terrain and in every climate, Aerols are famed throughout the entire world of aviation.

Ask the pilots who land on them!

THE CLEVELAND PNEUMATIC TOOL COMPANY
AIRCRAFT DIVISION • • CLEVELAND, OHIO

Also Manufacturers of Cleco pneumatic tools for the aircraft and general industry, Cleco sheetholders, Cle-Air shock absorbers for trucks and buses, and Cleveland rock drills for mining and construction work.

AEROLS*

*THE SHOCK ABSORBING UNITS ON AN AIRPLANE'S LANDING GEAR; THE NAME IS DERIVED FROM THE WORDS "AIR" AND "OIL" — THE FLUIDS USED TO DISSIPATE THE LANDING SHOCKS

The "Northrop group" tells how new U.S. shortcuts work to produce harder-hitting warplanes...faster!

TIME—MAN-HOURS by tens of thousands—go into template making on any new fighting plane design. For every part of the new airplane, there must be many duplicate templates, each shaped and cut and ground to an accuracy of .015 of an inch.

This has been one big reason why it has taken many months to get new airplanes of later, deadlier types rolling from the assembly lines in quantity.

It was a bottleneck which engineers of the Northrop group set out to break. After months of labor they discovered how to make identical duplicate templates by what's now known as "electrolytic etching." Today the new method turns out tens of duplicate templates in the time and with the labor formerly needed to make one.

This new process actually shortens by five precious weeks the stupendous job of putting a typical new-design, harder-hitting warplane into the air! This faster Northrop method of tooling is now being shared with other U.S. airplane makers.

Northrop is also turning over, for other manufacturers to use, the Northrop method of *welding with Helium* which has removed one barrier to the all-welded airplanes of the future.

Other aircraft companies, in turn, are informing the Northrop group of their own new-found secrets. In fact, all U.S. aircraft industry is pooling its techniques—pooling its new devices and discoveries clear down the line from blue-prints to finished planes.

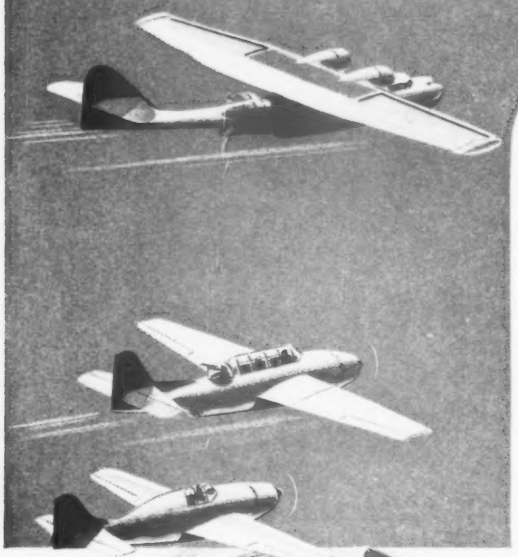
That is teamwork as U.S. plane designers and plane builders understand it. It is the "makings" of victory.

NORTHROP AIRCRAFT, Inc.

Northrop Field, Hawthorne, California

MEMBER AIRCRAFT WAR PRODUCTION COUNCIL, INC.

BACK OF THEM ...are the



Piloting the Navy's Consolidated Catalinas, Brewster Blasters, Douglas Dauntless', Grumman Wildcats—and other famous fighting 'planes of the fleet—are men whose skill has been developed on stalwart trainers of many types. Newest of them to take up "active duty" in the important job of training Navy pilots is the Timm Aeromold N2T-1—a smooth, sleek airplane that is an instructor's "dream"... developed for the Navy through close collaboration between the Bureau of Aeronautics and Timm engineers. It is a 'plane that sets entirely new standards for trainer performance... a 'plane that is simple to maintain, easily serviced and amazingly free from attack by corrosion or exposure to salt air.

TIMM AIRCRAFT

LOS ANGELES METROPOLITAN AIRPORT

A group of Timm N2T-1 Navy Trainers ready to take up their tasks of training Navy pilots.

The Navy's *First* Plastic Plywood Trainer

Selection of the Timm N2T-1 for training Navy pilots gives to Timm the distinction of building the Navy's *first* plastic-bonded-plywood trainers. The commercial version of this airplane, Model PT-220-C, also holds the distinction of being the *first* plastic-bonded-plywood trainer awarded Approved Type and Production Certificates by the Civil Aeronautics Administration . . . and is establishing enviable records in the training of CPTP Secondary students.

Timm *Firsts* like these are the result of advanced engineering, development of new and improved production methods for plastic-bonded-plywood—and the use of these new materials. All America benefits from the combined efforts of the Timm organization.

Corporation
VAN NUYS, CALIFORNIA

. . . . . Fabricators of wood and metal sub-assemblies.

Blue Ox

He has sworn to protect its secret with his life. When it is not in his possession it is under double-armed guard, twenty-four hours a day.

He alone carries it from the guard-room to the airplane, and when the mission has been completed, he carries it back to the guard-room. It is his responsibility. It is the Norden Bombsight. . . . He calls it the "Blue Ox."

The bombardier of a Flying Fortress* is the man around whom the great airplane is designed. Back of him and his instrument stretch thousands of man-hours, miles of blueprint, tons of aluminum, barrels of midnight oil.

An American bombardier, a "Blue Ox" and a Boeing Flying Fortress are the most formidable bombing team in the world. One reason is the great stability of the Flying Fortress, which provides a perfect bombing "platform" for "precision bombing." Another is the unequaled high-altitude performance, protective armament and fire-power, which enable the Fortress to reach her objective in daylight, despite flak or interceptors.

"Precision bombing" first began to be effective when the Fortresses bombed their objectives in Europe by daylight—from great altitudes—and with a hitherto unheard-of accuracy. This brand-new military tactic owes much of its effectiveness to Boeing engineers, who worked until they had designed an airplane with the speed, range, stability, load, fire-power and altitude to do the job.

The job still needs to be done, and the Fortresses are doing it every day—on major fighting fronts from Europe to the South Pacific. When the work of the Fortresses is over—when the war is won and the days of peace return—Boeing engineers will find many potential outlets for their skill and talents.

• • •

For in designing and building the Flying Fortress and other advanced aircraft, Boeing engineers and "productioneers" continually acquire new "know-how" in many fields: acoustical, electrical, structural, lubrication, etc. It's the kind of "know-how" that helps to win wars, and will some day help to make peacetime products better and cheaper.

DESIGNERS OF THE FLYING FORTRESS • THE STRATOLINER • PAN AMERICAN CLIPPERS **BOEING**

*THE TERMS "FLYING FORTRESS" AND "STRATOLINER" ARE REGISTERED BOEING TRADE-MARKS

TOOLS TO SPEED THE JOB!

IN a 'plane worker's kit of tools, every feature and detail of design that contributes to speed, precision and flexibility, is as important as in the most advanced automatic production equipment. *Often more important* . . . for it is at bench and assembly line that bottle necks may all too easily occur!

Throughout the aviation industry, there is a strong and steadily increasing preference for Snap-on tools. Their accuracy, flexibility and power lend speed and precision to the most difficult jobs. In tight and tricky places Snap-ons "reach right in", grip hidden nuts securely, turn them solidly.

• • •

The 3,000 tools in the Snap-on line . . . and Snap-on's direct-to-you service . . . are conveniently near you through 35 factory branches at key aviation centers throughout America. Send for catalog and full information.

Snap-on Tools
THE CHOICE OF BETTER MECHANICS

SNAP-ON TOOLS CORPORATION
8024-B 28th AVENUE • KENOSHA, WISCONSIN

It's Self-locking

The Boots principle of self-locking nut as employed in the Bellows, Wing, and Rol-Top (illustrated above) styles is well-known throughout the aircraft industry. In each case the nut is one-piece, all-metal. The self-locking action is obtained by means of the out-of-phase locking collar connected to the lead threads by means of a resilient spring member.

Here are a few of the planes fabricated with Boots Nuts:

Grumman Wildcat F4F-3
Boeing Flying Fortress B-17E
North American B-25
Curtiss Commando C-46
Consolidated Liberator B-24E
Curtiss P-40
Curtiss Dive Bomber SB2C-1
Brewster Buccaneer
Edo Floats
All Plywood Planes

BOOTS FOR THE PLANES OF CHINA

On the landing fields of China, even the coolie boy pitches in to help the maintenance men . . . and so he, too, knows about Boots for the planes of China.

If you could ask the men who repair the planes or the pilots who fly them, not only in China but wherever American fighter planes fly, you'd find out *why* Boots Nuts have earned such an enviable reputation. You'd learn that they are generally lighter in weight, have greater re-usability in maintenance and are proof against any airplane vibration. They literally "outlast the plane." There is lasting economy in the use of Boots Aircraft Nuts. And, of course, they meet the exacting specifications of all Government agencies.

For the engine manufacturer, Boots "Rol-Top" Nuts excel in performance under higher temperatures.

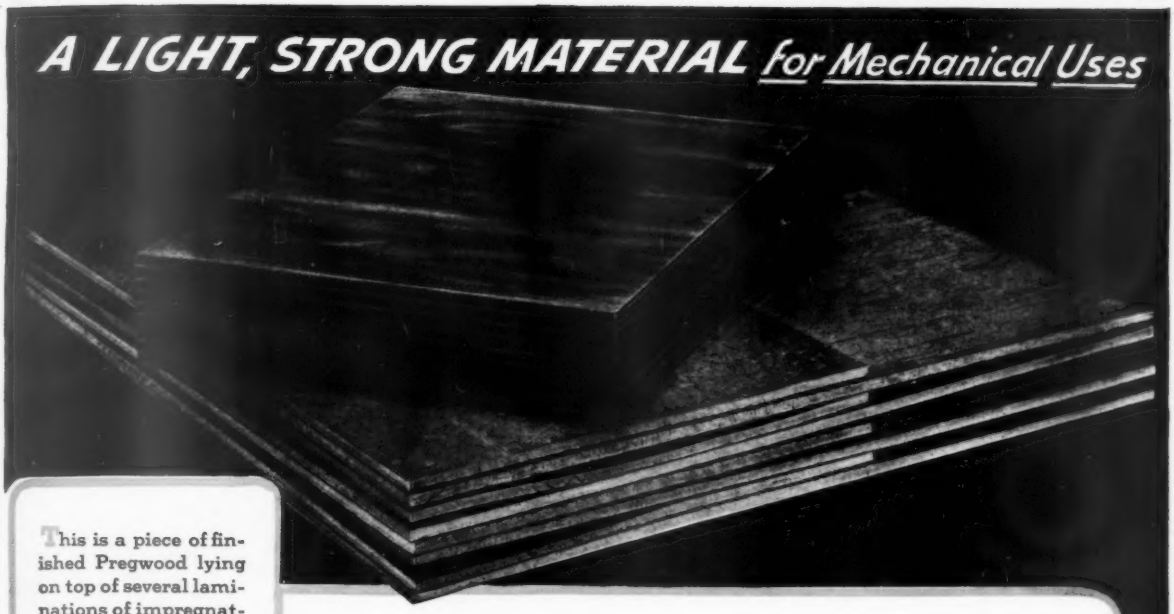
BOOTS

Self-Locking Nuts For Application In All Industries

BOOTS AIRCRAFT NUT CORPORATION ★ GENERAL OFFICES, NEW CANAAN, CONNECTICUT

"PREGWOOD" FORMICA

A LIGHT, STRONG MATERIAL for Mechanical Uses



This is a piece of finished Pregwood lying on top of several laminations of impregnated but uncured wood arranged to produce "Crossed Grain" Pregwood. The natural wood is reduced to one-half its original thickness when processed. In parallel grain Pregwood the laminations all run in the same direction.

PHYSICAL PROPERTIES OF PREGWOOD	CROSSED GRAIN	PARALLEL GRAIN
Specific Gravity	1.34	1.34
Tensile Strength PSI	12,000	30,000
Compressive Strength PSI	15,000	20,000
Modulus of Rupture in Bending PSI	18,000	35,000
Modulus of Elasticity in Bending PSI	2.7 x 10^6	2.7 x 10^6
Izod Impact	4 ft. lbs. per inch of notch	5 ft. lbs. per inch of notch
Shear perpendicular to laminations PSI	5,000	5,000
Shear Parallel to laminations PSI	4,000	
Moisture Absorption Maximum	6 per cent in 24 hours	6 per cent in 24 hours

Pregwood is a composite of wood veneers, thoroughly impregnated with thermosetting resin, compressed to half its original bulk, and cured into a hard, strong homogeneous material.

It has great strength, stability of dimensions, and light weight—qualities much appreciated by the aviation as well as many other industries. The material is produced in sheets of varying thicknesses. It can be machined readily to dimensions with the same tools that are used for cast iron.

Pregwood can be successfully glued to wood. It is offered for propeller hubs, complete propeller blades, and for edge strips glued to wood in air frame construction so that the bolts and fastenings attached through the "Pregwood" will not work loose. Samples on request.

THE FORMICA INSULATION CO., 4618 SPRING GROVE AVE., CINCINNATI, O.

FORMICA

Introduction

In this issue of Flying is presented the first complete report of U. S. Naval Aviation at War.

Once before we have had the great privilege of presenting to the American people a thorough and authoritative account of the Aviation Arm of the U. S. Navy. That memorable issue appeared on the newsstands within a day or two after the hideous Japanese assault on Pearl Harbor had horrified the sleeping nation. Those were black days, days of uncertainty, of deep perturbation, and perhaps of fear. The actual facts were obscured in a heavy veil of mystery. Rumors were circulated by enemy agents and repeated with the addition of terrifying details by the ignorant and the ill-informed.

The providential appearance of the big Special Naval Aviation issue of Flying at this precise moment was a reassuring note in the midst of the current excitement, hysteria and deliberately propagated nonsense. Congressmen, businessmen, and citizens generally found here a considered, exact and authoritative breakdown of the character and achievements of U. S. Naval Aviation. It was a statement prepared by competent Naval officers and it lent reassurance to the nation. The nation knew then that as a result of so perfidious an attack even the strongest power must suffer a dangerous setback. But it knew that our Naval Aviation, outpost of American defense in the wide blue reaches of the Pacific, was as sound and hard as the good American steel which went into its guns.

The spate of letters we received from all levels of American life indicated that this first U. S. Naval Aviation issue of Flying had ably filled the breach, as a simple recitation of the real facts and as a textbook on our warmaking qualities in the Pacific. The writers spoke glowingly as if they were grateful for the providential information which had thus appeared in full detailed picture and text between the two covers of our magazine.

Actually it was we who were grateful that circumstance had privileged us to render this service to our country at a time when it was needed. If Flying had performed no other function in its fifteen years of issue, by this single act of service it would have justified every reason for its existence from the beginning.

This second special issue devoted to U. S. Naval Aviation at War is a logical sequel to the first. It is a report to the American people, to those whose sons are fighting in the various theatres of action, to those who know how great the stakes are and how dreadful will be the result of defeat. It is a statement in simple rugged terms, from which the American people can draw renewed faith and breathe deep confidence. For here in this graphic picture of the very spearhead of our arms, the American people will see the projected shadow of that victory which will finally be ours. This picture of efficient organization, of rapidly growing power, will warm the heart of every citizen. From the cold mechanics of this complex, gigantic operation is emerging an irresistible machine of modern combat. It is the backdrop against which the exploits of our heroic young Naval airmen shine in that luminous glory which is theirs.

Flying presents the following account with pride, and with faith in our inevitable victory.

William B. Ziff

Editor and Publisher, Flying

The NAVY'S AIR ARM

by

Col. FRANK KNOX

Secretary of the Navy

A newspaper executive and civic leader for 40 years, Colonel Knox became Secretary of the Navy July 11, 1940. Born in Boston in 1874, he served with Roosevelt's Rough Riders in Cuba, was a distinguished officer in the World War. He has been a colonel in the Field Artillery Reserve since 1937. Before his appointment as Secretary of the Navy, he was publisher of the Chicago Daily News.

A YEAR ago I detailed in the pages of this publication the progress of Naval aviation. Since then the Navy has been plunged into the maelstrom of war. Our planes and pilots have had to meet the acid test of battle. How have they taken it? I think the record speaks for itself.

The spearhead of our first offensive action was the raid of carrier-based planes on the Gilbert and Marshall Islands on the 1st of February. Our planes came in for their first good smash, and they left the Jap with his teeth rattling. Later that month an enemy force attacked one of our carriers off Bougainville in the southwestern Pacific. Our tough, little Grumman *Wildcats* went into the air and knocked down 16 out of 18 Jap bombers . . . The long, arduous months of training in tactics and gunnery were paying off.

Not long afterwards our planes duplicated the Gilbert and Marshall successes with raids on enemy-held Wake and Marcus Islands. The damage inflicted on enemy shore installations was substantial. But all these had only been the Navy's left jabs. We were getting set for a right hook. It came in the action at Salamaua and Lae on New Guinea. Our carrier-based dive bombers, fighters and torpedo planes swarmed over a mountain pass and roared down on a large Japanese force. Before the enemy finished blinking his eyes our planes had sunk two heavy cruisers, one light cruiser, one destroyer and five transport and cargo ships. Two destroyers and four other enemy vessels were seriously damaged. Losses sustained by the Navy for the entire attack amounted to one dive bomber.

The pattern of this attack was repeated at Tulagi on May 4. One light cruiser, two destroyers, a cargo ship and four gunboats were sunk. In addition to this five enemy planes were shot down by our fighters.

Three days later our carrier-based planes again went to work—this time on a Japanese force advancing on Port Moresby. The attack developed into the epochal Coral Sea battle—our first substantial Naval victory of this war. The final score showed a Japanese carrier and cruiser sunk, two other carriers badly damaged, and 91 enemy planes shot down. It was here that the men of the great carrier *Lexington* displayed their amazing coolness under fire when, preparing to abandon ship, they stood calmly on the flight deck eating the last of their supply of ice cream.

But all this had only been a warm-up for the Battle of Midway—the biggest skirmish of its kind the world had ever seen. It came a month later when our dive and torpedo bombers flew out to meet a great concentration of Jap ships. In that struggle our flying men set a standard of heroism that has never been surpassed. From the standpoint of ships sunk and planes downed it was the greatest Naval victory in history. Our men sank two enemy cruisers, two destroyers and four capital ships—the aircraft carriers *Kaga*, *Akagi*, *Soryu* and *Hiryu*. It was the first real test of our new torpedo-carrying planes—the *Avengers*. They demonstrated decisively their top-ranking position as the most effective planes of their type yet devised. As such they constitute a most potent addition to the strength of our Fleet.

(*Continued on page* 286)

THE JOB HAS JUST STARTED!

by

Hon. ARTEMUS L. GATES

Assistant Secretary of the Navy for Air

Entering the Navy as a Reserve ensign in World War I, Mr. Gates attained the rank of lieutenant commander before being downed in combat. He was captured by the enemy and held as a prisoner of war until the Armistice. Born in Cedar Rapids, Ia., November 3, 1895, he holds the Distinguished Service Medal, as well as the English DFC.

A YEAR ago in the special Naval aviation issue of this magazine, which went to press before Pearl Harbor, the statement was made that Naval aviation was literally vital to the Navy and that the Navy, recognizing this, was seeking in every way to assist the program of its air arm.

How vital Naval aviation is and what an integral part of the Navy it is in actual combat has been dramatically demonstrated many times in this critical year. The full story of the first twelve months of the war has not been told. Indeed, only fragments of the story have been made available to the public because of strategic reasons. It is my belief that in the months to come many more of the deeds of our Naval aviators, of their planes and the men behind the planes, on carriers and at our far-flung shore bases, can be disclosed.

Even before the war, Naval aviation had a long and splendid record of achievement, a record which caused it to be regarded as the outstanding naval air arm of the world. That reputation has been more than justified in the fateful year of 1942. Wake Island, the Marshall and Gilbert Islands, Midway, the Coral Sea, Lae, the Aleutians and the Solomons—already these names have become a part of the history of Naval aviation and of this nation.

But, proud as we are of the achievements that have made these names historic, we must remember that the job has just started. No one recognizes this fact more clearly than the men of our Navy, wherever they may be. There are unmistakable signs that the men and women behind the planes and carriers and bases, the workers in the aircraft industry and shipyards, the engineers and the men and women on the management side, who are tackling problems of which they had no conception a few months ago, realize today that they must face and accomplish a bigger task ahead. Only by hard, unremitting work can we live up to our obligations to the Navy and to the people of America. I repeat, all of us must remember that the job has just started.

THE FLYER FIGHTS THE WAR

by ADM. ERNEST J. KING

Through his wide experience in submarines, airplanes, carriers and staff duty, Admiral King is particularly well qualified to serve as Commander in Chief of the United States Fleet. He also serves as Chief of Naval Operations, thus combining two most important Navy posts for a unified command. Admiral King holds the Navy Cross with the Gold Star and the Distinguished Service Medal.

FROM what I read in the newspapers, from what I hear over the radio and from information that has reached me through other channels, I have come to the conclusion that a great many people in this country, strange as it may seem, are under the impression that the tremendous importance of Naval aviation as a part of our military organization was discovered on December 7, 1941.

Certainly, there has been an organized effort, covering a period of several years, to make this country airminded, and so far as the younger generation is concerned I think it has been reasonably successful. Almost any American boy can rattle off the various aircraft designations and, furthermore, can readily identify planes when he sees them in the air. For some reason or other, however, many older people have continued to regard the airplane as a comparatively recent invention. Until a year ago, perhaps two years, they did not give much thought to the question, in spite of the fact that the war in Europe was an almost daily object lesson and in spite of much discussion, here in the United States, about aircraft production and potentialities.

The facts of the matter are that the United States Navy pioneered in the development of aircraft as a military weapon. Believing in it, from the very first, we have spared no effort to develop it and to fit it into our organization. We have watched it grow, and we have grown with it. We were thoroughly airminded a long while ago. We took advantage of each and every advance in aviation. We established a Bureau of Aeronautics. We built and tested carriers. We experimented with and developed various types of planes and we worked out techniques for their tactical employment. In short, aviation soon became an integral part of the profession of every Naval officer, regardless of whether or not he himself was an aviator. It has been a good many years since any large scale training maneuver without Naval aviation—or for that matter, military aviation in general—was considered comprehensive.

There is another feature of the situation which I wish to emphasize. Because of the fact that Naval aviation emerged from its infancy so long ago, we have had an opportunity to train a great many more aviators than is generally realized. It is true, of course, that after an individual reaches a certain age his days as a pilot are over, but it is not true that his days in aviation are over. He has been there and he has been trained to think in terms of aviation; his experience has provided him with a fund of knowledge and a familiarity with the air that cannot be taken away from him.

We have, therefore, aviators in all stages of their career—the students, the younger pilots finding out what it is all about in the Fleet, the experienced pilots who are at the peak of their flying efficiency, and the older pilots and ex-pilots in the higher echelons.

I know of no seagoing Naval officer who does not understand thoroughly that aviation is the *sine qua non* of almost every phase of modern warfare. Likewise, I know of no such officer who holds that aviation by itself will win the war. I think we all realize that it is co-ordination that counts, and that we must make the maximum use of whatever weapon or weapons will be most effective under a given set of conditions. What we are striving for is teamwork!

Our Naval air forces have consistently given an excellent account of themselves in the current war. As our strength increases, in both planes and ships, and in men trained to fight them, our enemies will find out that our knowledge of how to fight in the air was not picked up in the last few months.

We will win this war!

BUAER

The Bureau of Aeronautics, Naval aviation headquarters, has successfully met the test imposed by a global war.

by Rear Adm.
JOHN S. McCAIN

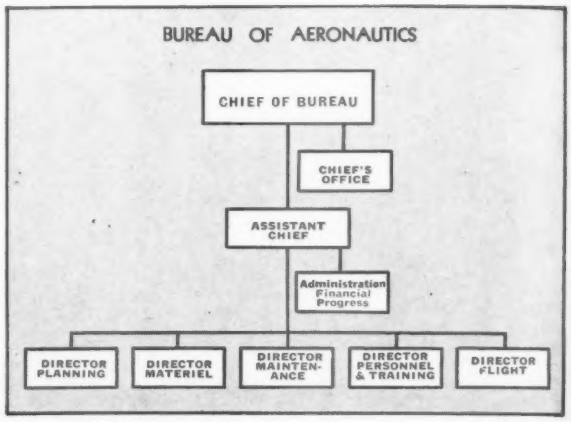
Rear Admiral McCain, recently awarded the DSM for "his tireless energy and extraordinary skill, contributing greatly to occupation of the Guadalcanal-Tulagi area by our forces . . ." became chief of the Bureau of Aeronautics on October 9, 1942. Born in Teoc, Miss., in 1884, he graduated from the Naval Academy in 1902.

ANY review of the work of the Bureau of Aeronautics is essentially a review of the operating success of Naval aviation in action with the enemy. The sole purpose of the Bureau is to supply our fleet with the kind of airplanes and the kind of aviators that can help destroy our enemies in the shortest possible time.

Viewed in this light, the first year of our participation in the war has tested under fire all the major principles of the Bureau which have been formulated in the years of peacetime preparation. The most important of these have met the test and proved their value. The carrier squadrons, quickly maneuvered into striking range by their "flying fields afloat," have shown time after time that they can operate not only as an adjunct to the fleet, but often as the major striking force of the fleet. The insistance of the Bureau on the inclusion of heavy firepower, armor and self-sealing gasoline tanks in its fighter aircraft has contributed to the Navy's high percentage of success in fighter actions, and has won the respect of critics who at first were prone to minimize these advantages in favor of certain others. The torpedo plane, first conceived and developed by Naval aviation, has taken its rightful place as the deadly weapon that it is. The dive bomber has done the same. The patrol and scout planes have shown their ability to search successfully vast areas of open ocean and to operate in every kind of weather, from the freezing cold of Iceland and Alaska to the burning heat of the South Seas. The blimps of the lighter-than-air branch of the service have demonstrated in action how useful they can be in the exacting work of convoy duty and anti-submarine patrol. And on every hand the superb fighting caliber of our pilots has shown dramatically the value of continued insistance on none but the highest standards of training.

The proving of these principles is the heartening thing, for it shows that the long years of careful experimentation and planning have been along sound lines. But we have the most urgent need for more of everything.

Each carrier which we have lost has taken such a heavy toll of enemy ships and airplanes that its very loss has shown how badly we need more. We need more fighters, more dive bombers, torpedo planes, transports, scouts, patrol bombers and blimps. But in procuring them we must never lose sight of the fact that qualitative superiority is even more important than quantity. We must have not only more airplanes than the enemy, but airplanes that will continue to give us superior performance in the face of increasing improvements in the design of the enemy's own aircraft.



Organization chart of Bureau of Aeronautics, known by Navy as Buaer.

The aircraft industry, aided by members of the automobile and other industries converted to aircraft manufacture, have risen in a solid front to help meet this double-barreled problem. The results of their great efforts on the quantity side will reach with telling effect to every major battle front in 1943. From the standpoint of quality, it should be encouraging to every American citizen to know that in each major combat type—fighters, dive bombers and torpedo planes—we now have in quantity production airplanes far superior to the corresponding types with which our Naval aviators fought so successfully during this first year. These new types are bound to increase our pilots' advantage over the enemy in the crucial split-seconds of action that spell the difference between victory and defeat. The fighters and torpedo bombers now going out to the fleet have more power, more speed and range than any other comparable types seen in action so far. Our new dive bombers can carry larger loads, and carry them farther and faster than ever before. Similar improvements in our patrol, transport, scouting and cargo planes will give the men in these important branches of the service greater and greater assistance in carrying out their missions.

As the bulk and quality of this new equipment become available to the Fleet in the coming months, we can count on our Naval aviators to put the new types to work with all the skill and determination for which they are famous. These men are fighting for their lives—and ours. It is up to all of us at home to get them what they need—and get it quickly.

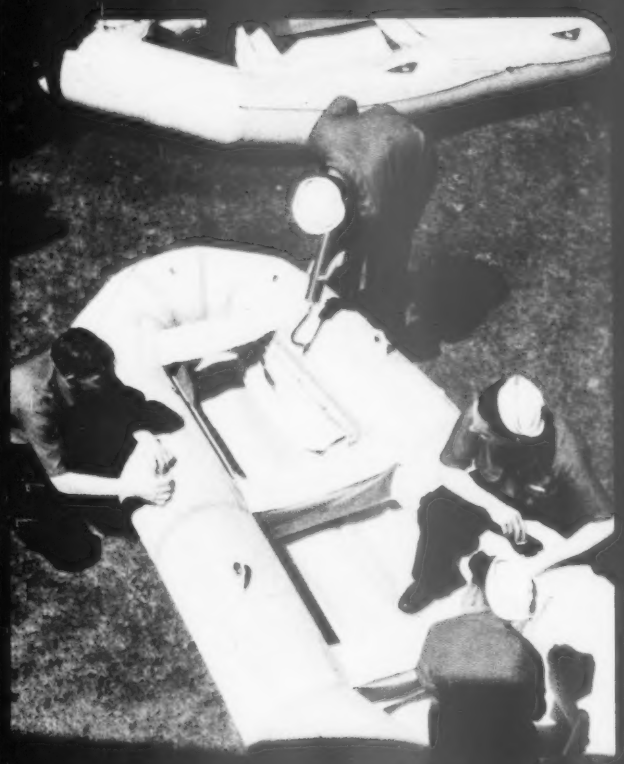
END

COLOR PHOTOGRAPHY

The 27 color photos appearing in the following section present a vivid record of Naval Aviation at War ... and the machines and men doing the job.

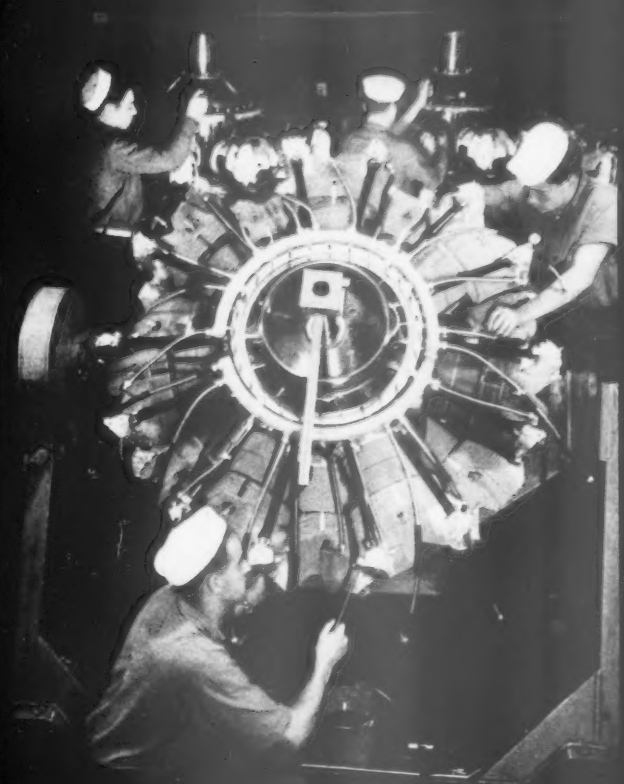
Rear Admiral JOHN S. McCAIN
Chief, Bureau of Aeronautics, United States Navy
John S. McCain

"MEN MAKE NAVAL AVIATION—



Instantly inflatable life rafts are carried by all Navy aircraft. One-man rafts are built into parachute packs.

For oblique "record" photographs, Navy photographers use this F-56 camera. Its 20-inch lens is electrically heated.



Aviation engine mechanics in the Navy are Aviation Machinist Mates, third, second or first class (AMM3 c, etc.).

This man is a Parachute Rigger, first class. The Navy has special schools for training personnel in such branches.

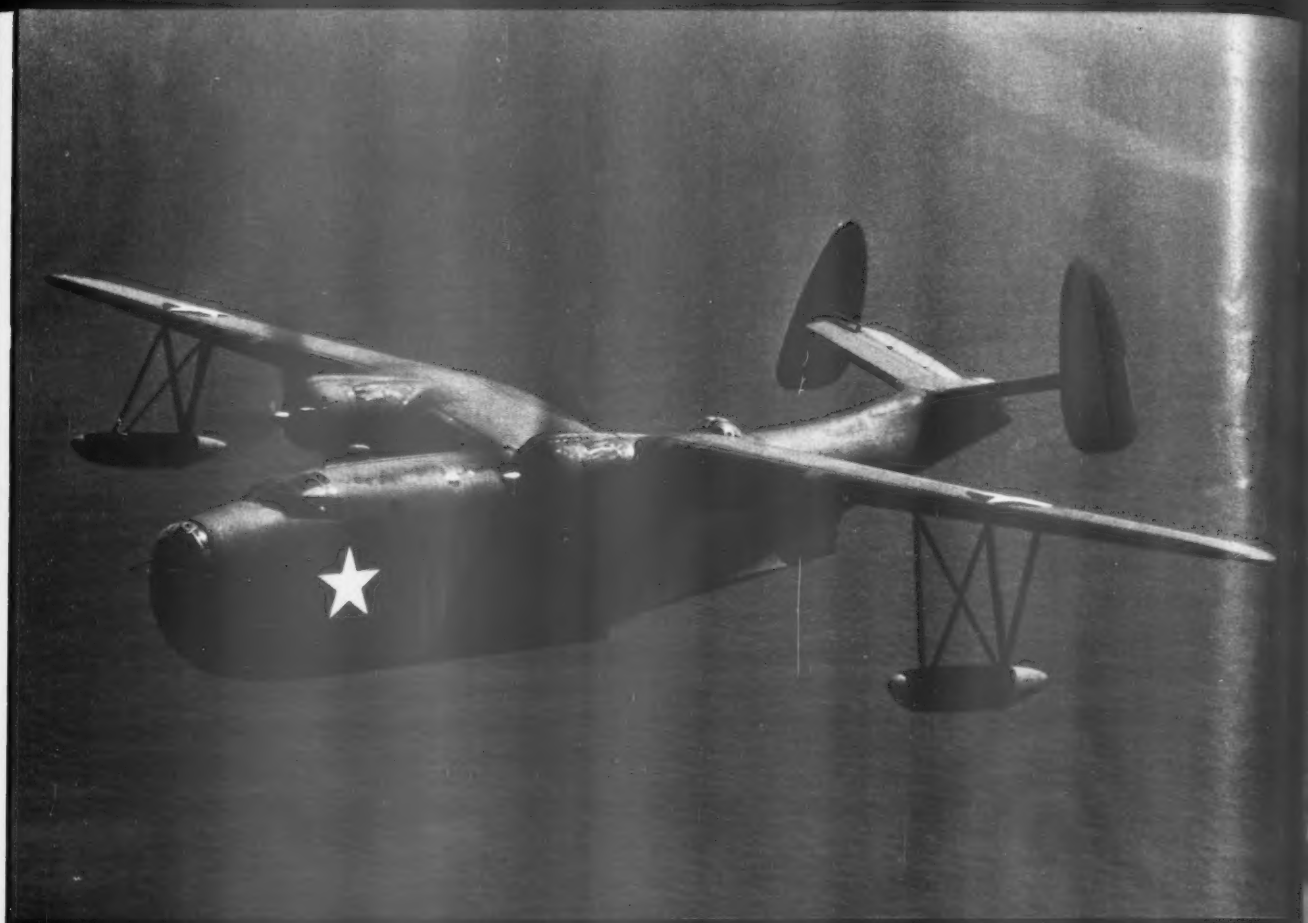
N—NAVAL AVIATION MAKES MEN"

Aviation meteorology in the Navy is called aerology. The chief petty officer above holds the rating of aerographer.

While awaiting the return of their plane, a Navy ground crew watches another group prepare to beach a Navy SON.

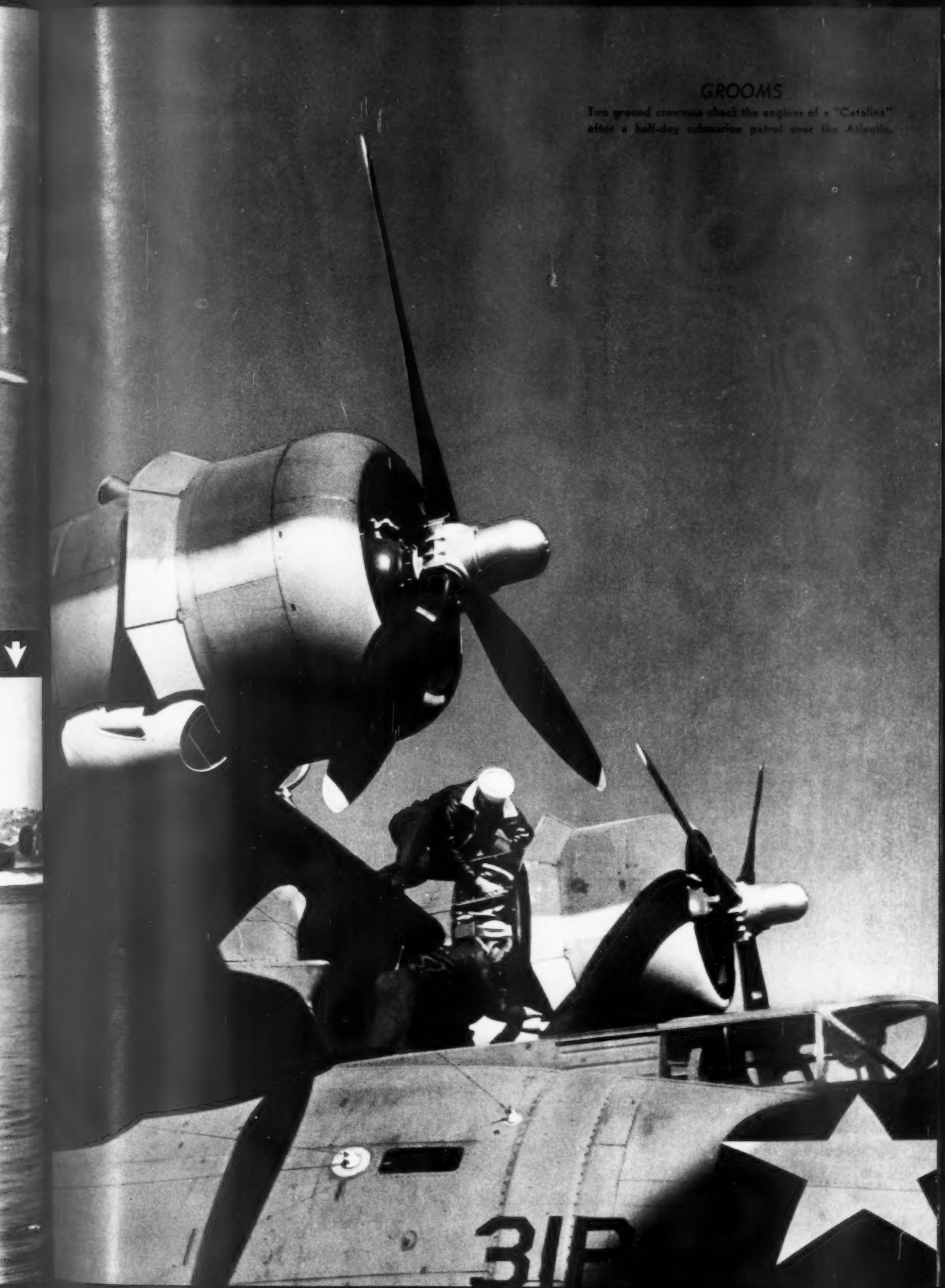
Aviation machinist mates usually select one phase of their general work and specialize in it, like this propeller man.

Important in training of Naval airmen is experience in hand-to-hand combat. Professional athletes are best instructors



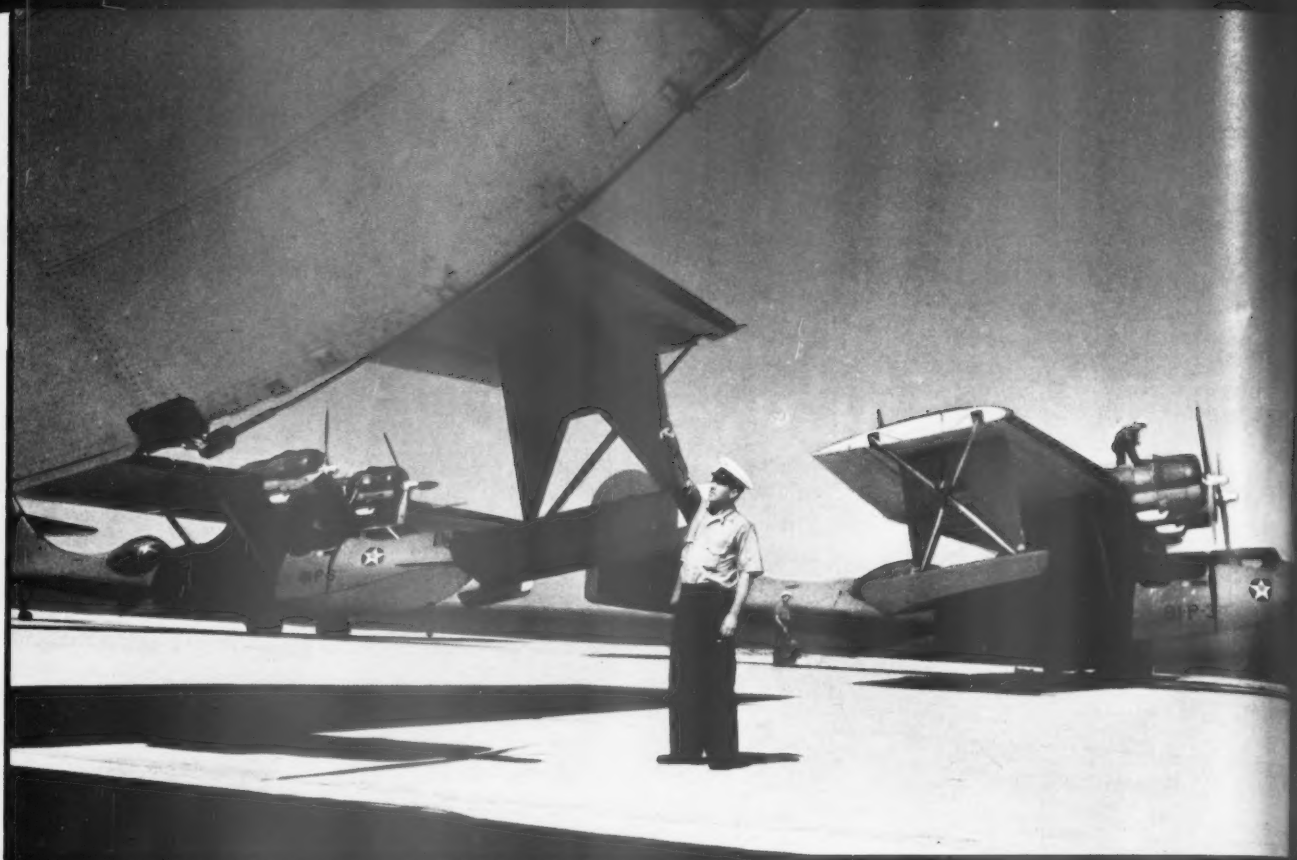
Latest twin-engined flying boat in the Navy is this Martin "Mariner" (PBM-3). Many have been adapted for cargo work.

Giant of the Navy's air force is the Consolidated PB2Y-2, or "Coronado." It has four engines, long range, many guns.



GROOMS

Two ground crewmen check the engines of a "Catalina" after a half-day submarine patrol over the Atlantic.

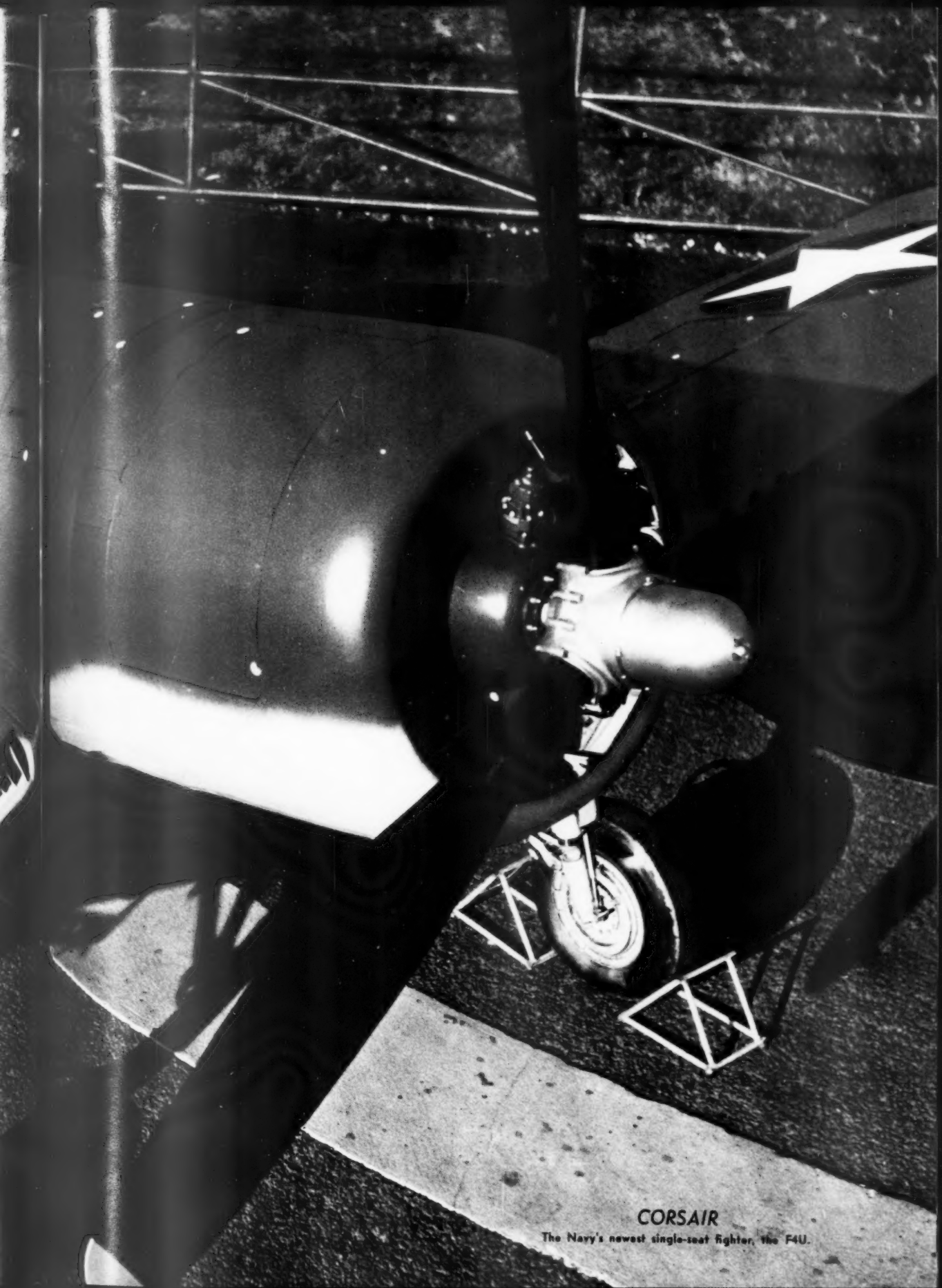


Oldest patrol bomber in operation in the Navy is the "Catalina" (PBY-5), still widely used in all theaters of war.

Back from an operational flight, this Martin "Mariner" is washed with fresh water to prevent corrosion by salt water.

SPECIALISTS

This typical Navy fighter pilot, with his "Wildcat," have specialized in exterminating Japs in the Pacific.

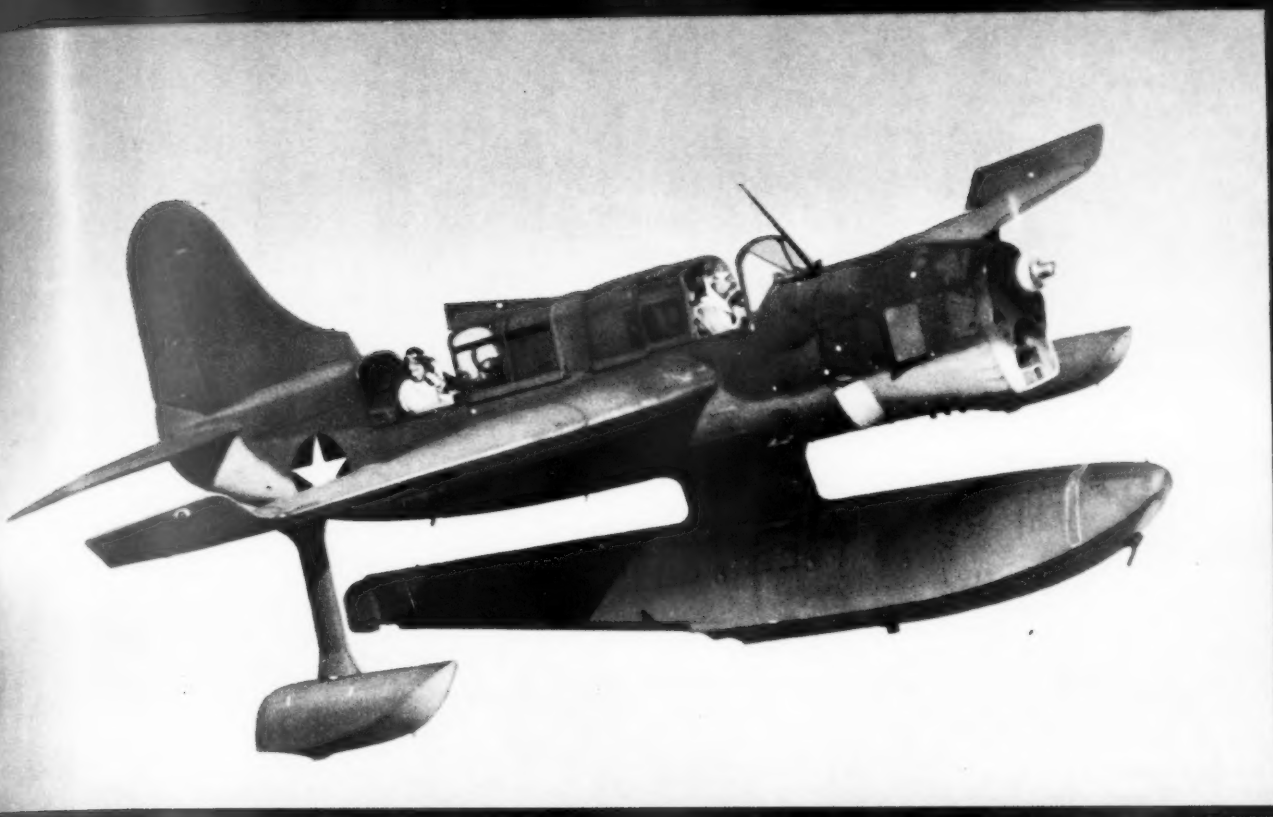


CORSAIR

The Navy's newest single-seat fighter, the F4U.

Standard torpedo bomber is the Grumman "Avenger" (TBF). is built by General Motors as TBM. Range is 1,400 miles.

Grumman "Wildcat" (F4F) has made air-war history against Japs. It has six .50 caliber guns, 1,200 h.p. engine, long range.



Newest observation-scout in service is the Curtiss "Seagull" (SO3C). It has Ranger engine, unusual upturned wing tips.

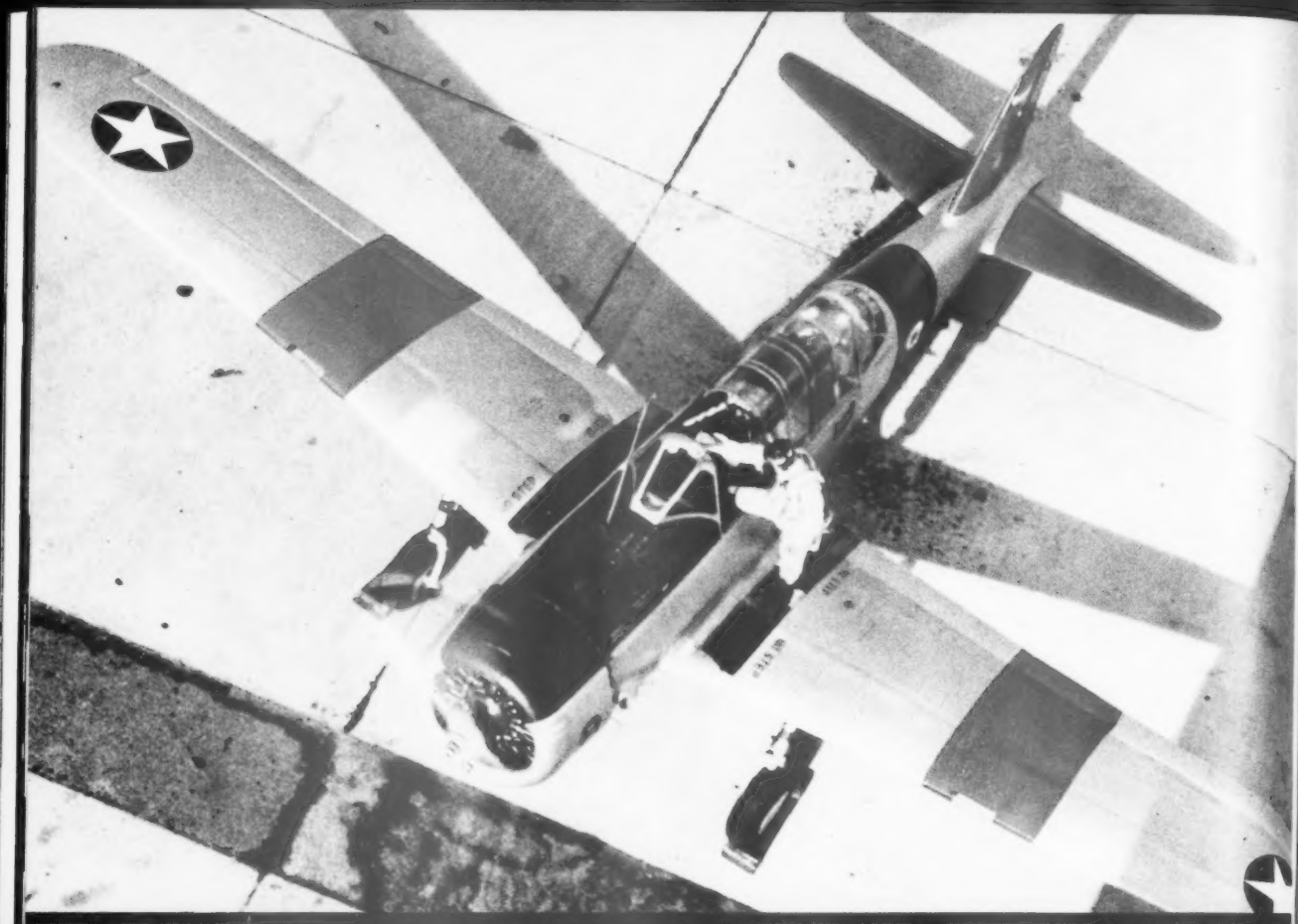
Widely used for scouting and convoy work is "Kingfisher" (OS2U), more commonly seen on floats. It has two in crew.

DAUNTLESSES

Japanese admirals dread the sight of these Navy Douglas "Dauntless" dive bombers more than any other aircraft.

OUTWARD BOUND

Enemy surface vessels have been sighted and the first "Dauntless" is signalled into the carrier's take-off lane.



A scout-trainer now widely used at advanced Navy training bases is the Vultee SNV, also in U. S. Army as BT-15.

About to take off on a short scouting mission, this SBD gets a careful inspection by her hard-working ground crew.

Veteran primary trainer still widely used is Navy N3N-3, built at the Naval Aircraft Factory with wheels or floats.

First used by Navy as patrol plane in early 1930's, Consolidated P2Y-2's still are used as trainers at Pensacola.

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NAVAL

L AVIATION

COWS
About to go out on coastal patrol, these Navy blimps are being readied in their hangar at Lakehurst, N. J.

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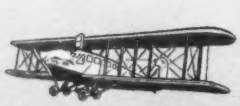

1928·Curtiss B-2 Condor Bomber for the U. S. Army. Greatest weight carrying air-

1929·Curtiss Condor, 2 pilots

1933·Curtiss Condor, the first sleeper plane—6 compartments

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The BATTLES

After its initial disaster at Pearl Harbor, Naval aviation went into battle to score, with few exceptions, triumphant victory.

Pearl Harbor, December 7, 1941

THE BATTLES

Japs overhead! These are 20 mm. antiaircraft guns aboard a carrier.

The following detailed summary of all Naval air battles since the war began is presented herewith for the first time. Every major operation to and including part of the Solomons is given.

ON December 7, 1941, the date that will "live in infamy," a Japanese task force savagely attacked Pearl Harbor. The attack occurred while representatives of Japan were negotiating in Washington with U. S. statesmen in an effort to find a peaceful solution of the two nations' misunderstanding.

The violence and surprise of this underhanded assault were such that our Pacific Fleet was severely crippled. Our losses placed us at a temporary disadvantage in the war which was soon declared between this country and Japan. The U. S. Navy, however, made what was perhaps the quickest comeback in the history of sea warfare. Less than two months after the tragic action at Pearl Harbor, in which 3,000 Americans were wantonly butchered, Rear Admiral Halsey, commanding a carrier task force, smashed into the Jap-held Marshall and Gilbert Islands with a ferocity and destructiveness that were but a small indication of what was to come.

In that brilliant raid on February 1, Naval aviation took the lead in the fighting. Throughout the following narrative—an account the Navy has just released of our engagements in the Pacific—Naval aviation is consistently the spearhead of the attack.

This is a story, told without attempt at rhetorical effort, of the high courage and skill of the men who fly the Navy's planes. It speaks well, too, of the planes themselves and of the close co-operation between the several branches of our military. Confined to major actions, it does not deal thoroughly with many of the important but less spectacular aviation activities, such as the anti-submarine patrol, the work of the blimps, the many weary miles of long-range scouting, the achievements of the Naval Air Transport Service, and the pilot training program.

But it is, on the whole, perhaps the most impressive single document that has come out of this war, a record of continuous victory against topheavy odds, in the finest tradition of the Navy.

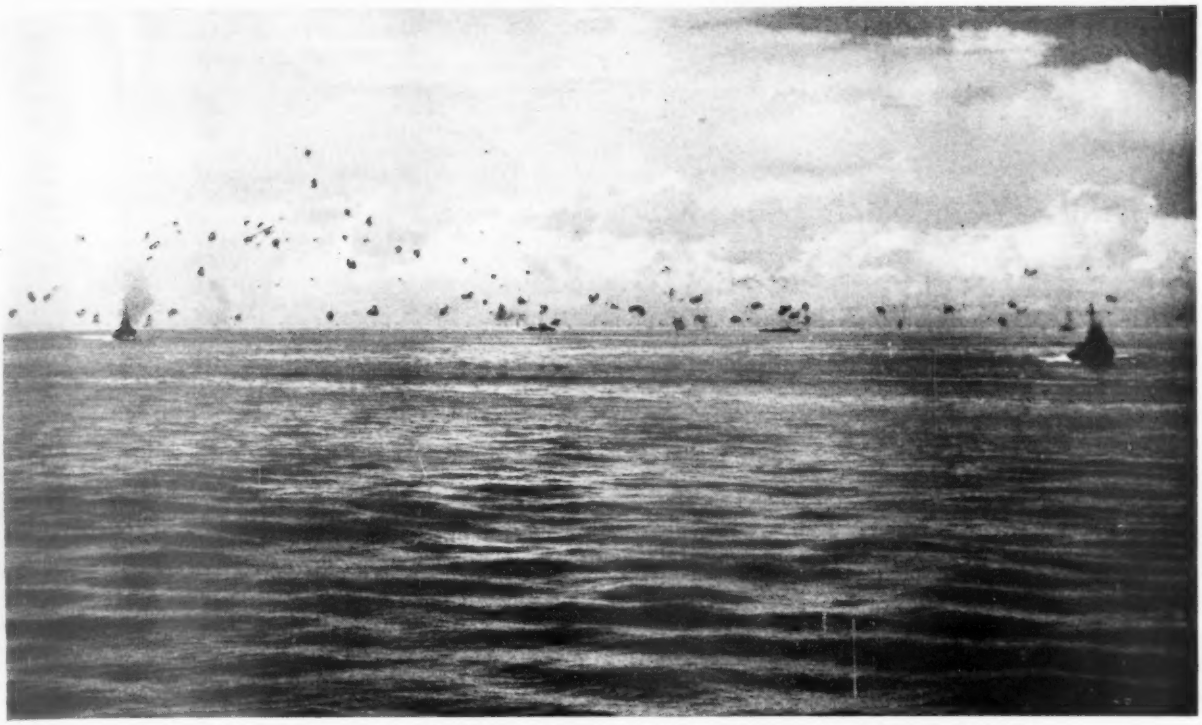
The Marshall and Gilberts

Within a few short weeks after Pearl Harbor, the Navy had driven home its first offensive thrust against the Japanese. This was the telling raid by air and surface forces against the Marshall and Gilbert Islands, and marked the first offensive use of aircraft carriers by the United States Navy.

The action took place on February 1st, with carriers as the spearhead of a task force which included heavy surface ships. It was led by Admiral Halsey. While the surface units shelled enemy installations with heavy fire, the air groups of the carriers bombed and torpedoed enemy vessels caught in the harbors and directed devastating bombing and strafing attacks against the air fields, hangars and supply buildings at seven separate enemy strongholds.

The *Yorktown* Air Group, led by Comm. C. S. Smiley, concentrated on Jaluit, Makin and Mili. In the face of extremely bad flying weather, attacks were pressed home by Douglas *Devastator* (TBD-1) torpedo bombers under Lieut. Comm. J. Taylor, and by Douglas *Dauntless* (SBD-3) dive bombers under Lieut. Comm. R. G. Armstrong, and Lieut. Comm. W. O. Burch. Four auxiliary vessels were heavily bombed and at least two destroyed. Small harbor craft were strafed and barracks and administration buildings bombed and set afire. Two Japanese four-engined seaplanes were destroyed on the water. Another four-engined seaplane was shot down by Lieut. (j.g.) E. S. McCuskey of a fighter squadron.

The greatest damage, however, was caused by the air group of another carrier which found better targets on the islands assigned to it. Under Comm. H. L. Young, commander of this air group, three attacks were made on Taroa, two on Kwajalein, two on Wotje, and two on Roi. All eight of these actions were highly effective. Squadrons under Lieut. Comm. H. L. Hopping, Lieut. W. E. Gallaher, and Lieut. Comm. W. R. Hollingsworth blew up hangars, storehouses and ammunition dumps, and destroyed many Japanese airplanes parked on



A hot battle in progress in the Solomons, between U. S. Navy surface vessels and Jap torpedo planes.

runways adjacent to the hangars. Lieutenant Commander Hopping, diving very low to ensure a hit, was shot down and killed during this action.

Seven airplanes from a scouting squadron led by Lieut. C. E. Dickinson, Jr., and Lieutenant Gallaher scored hits on a Japanese cruiser, a *Yawata*-class vessel, a large tanker and a submarine in the harbor of Kwajalein Island. A bombing squadron under Lieutenant Commander Hollingsworth also attacked at Kwajalein and bombed a cruiser, strafed three submarines, sank another vessel (by Lieut. J. W. McCauley), damaged two cargo ships, set a transport afire and destroyed numerous buildings on shore.

Lieut. Comm. E. E. Lindsey led a bombing attack on the same targets at Kwajalein. This was followed by a torpedo attack against the ships in the harbor, led by Lieut. Comm. L. E. Massey.

On this first torpedo attack by U. S. Navy airplanes, Lieutenant Commander Massey led nine Douglas *Devastators* 180 miles to the target. In the face of blistering antiaircraft fire, he ordered his division to "take them home, boys!" The airplanes pressed their attack on a cruiser, many auxiliary vessels and the large *Yawata*-class seaplane tender or transport. A three-plane section, under Lieut. P. J. Riley, concentrated on the cruiser and left her sinking by the bow. The *Yawata*-class vessel was hit by torpedoes and it settled by the stern. Three tankers were struck and left in a sinking condition. All nine torpedo bombers returned safely.

A fighting squadron flying Grumman *Wildcats* (F4F-4) under Lieut. Comm. C. W. McClusky destroyed several airplanes by strafing attacks at Taroa and Wotje, and shot down several more in the air. Our airplanes caused the following losses to the Japanese:

35 Japanese airplanes shot down or destroyed on the ground.
13 auxiliary and patrol vessels sunk.
1 cruiser damaged and left in a sinking condition.
1 *Yawata*-class seaplane tender or transport damaged and left in a sinking condition.
2 other vessels damaged.
Numerous hangars, storehouses, barracks, an ammunition dump, a fuel tank and a radio station completely destroyed.

Our losses were:

5 Douglas *Dauntless* scout bombers.
1 Grumman *Wildcat* fighter.
1 Curtiss scout observation plane (SOC).

Bougainville

The next major action in which Naval aviation played a part came at Bougainville, a defensive engagement—but one which cost the Japanese dearly.

On February 20th, the *U.S.S. Lexington* was steaming westward in company with other members of a task force. Off the island of Bougainville, the *Lexington* was located by two Japanese patrol planes and the Japanese sent out 18 twin-engined land-based bombers to attempt to sink her. A *Lexington* fighter squadron, with its Grumman *Wildcats*, was ready and waiting to intercept this force.

Under Lieut. Comm. J. S. Thach, commanding officer, the squadron located the first of the Japanese patrol planes and shot it down 43 miles from the carrier. A second was shot down by a two-plane section of Grummans led by Lieut. O. B. Stanley.

The squadron then was ordered to intercept the oncoming Japanese bombers. Five of the first nine bombers were shot down before they reached the *Lexington*. Three more were shot down after their bombs had fallen 3,000 yards away.

Meanwhile, a second group of nine enemy bombers was approaching. Since most of our fighters were pursuing the first group, only two Grummans were in a position to attack the second group. The guns of one of these fighters jammed, and Lieut. E. H. O'Hare attacked the formation of nine bombers single-handed. He shot down two immediately, and only four were able to drop their bombs. Lieutenant O'Hare persisted in his attack and brought down three others.

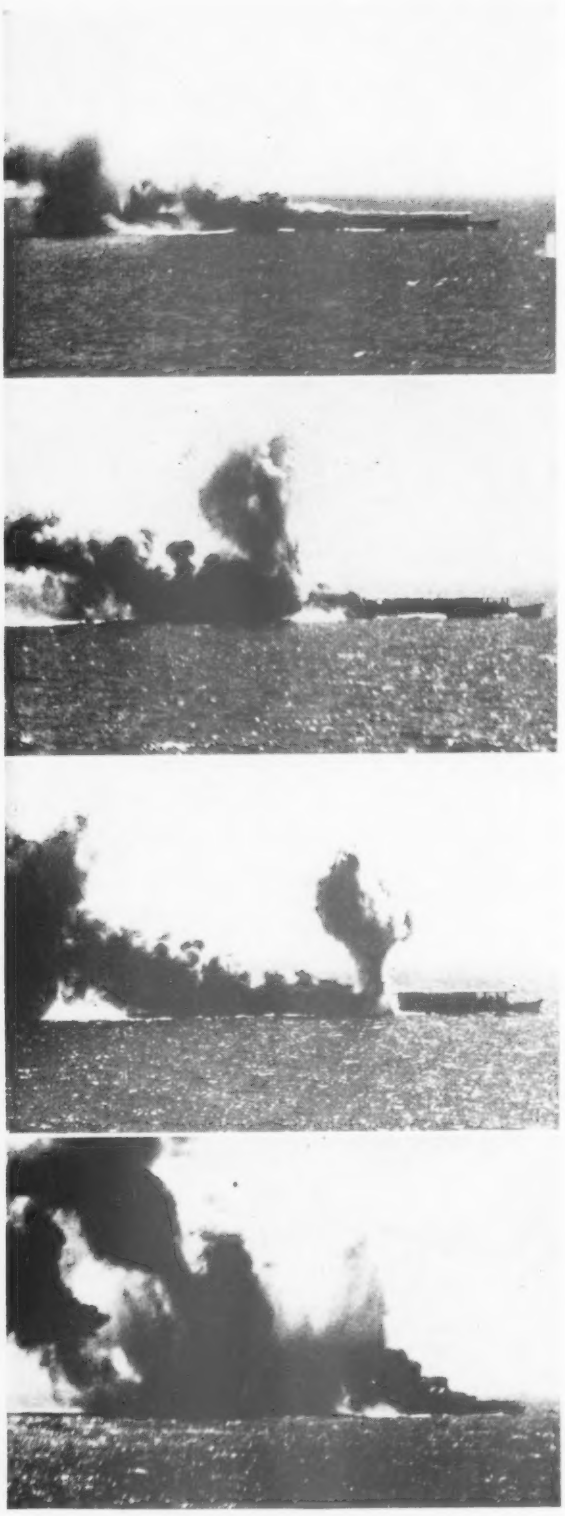
Of the four remaining bombers from this group, two were shot down by fighters, one by a scout bomber.

Enemy losses were as follows:

2 out of 2 four-engined patrol planes shot down.
16 out of 18 two-engined bombers shot down.
1 two-engined bomber probably lost.

Our losses were:

2 Grumman *Wildcats*, with one of the pilots saved.
There was no damage to the *Lexington*.



These amazing pictures show a U. S. torpedo plane attack in operation. The already-burning Jap carrier is the "Ryukaku," a victim of the Coral Sea battle. In top picture, torpedo splash at right shows where TBD launched it. Meanwhile, a dive bomber scores another hit. Then the torpedo explosion is seen, after which the "Ryukaku" is left to burn and sink.

Wake and Marcus Islands

The successes scored at the Marshall and Gilbert Islands were repeated at Wake Island on February 24th and at Marcus Island on March 4th. The raids on enemy positions at Wake and Marcus were led by Comm. H. L. Young.

Wake was dive-bombed and strafed by squadrons led by Lieut. Comm. W. R. Hollingsworth, Lieut. Comm. C. W. McCluskey, Lieut. W. E. Gallaher and Lieut. Comm. E. E. Lindsey, respectively.

Marcus, an "air field surrounded by water" was attacked by Douglas *Dauntless* dive bombers and Grumman *Wildcats*. It was difficult to assess the damage due to low clouds.

Known enemy losses were as follows:

At Wake:

3 four-engined patrol planes shot down or sunk at their moorings.
1 patrol vessel sunk.
1 fuel barge set afire.
6 buildings destroyed.
6 buildings damaged.
2 hangars destroyed.
7 gasoline tanks destroyed.
Several ammunition magazines blown up.
20 bomb craters left in air field runways.

At Marcus:

7 buildings hit and set afire.
2 hangars hit and set afire.
1 magazine blown up.

Our losses were as follows:

At Wake:

1 Douglas *Dauntless* with its pilot and crew.

At Marcus:

1 Douglas *Dauntless*. Personnel of this airplane were seen to man their rubber boat before the plane sank.

Salamaua—Lae

On March 10th, more than 100 carrier-based airplanes were launched to attack a concentration of enemy warships, transports and cargo vessels in the Salamaua-Lae section of New Guinea. The participating squadrons from the *Lexington* and the *Yorktown* included Douglas *Dauntless* dive bombers, Douglas *Devastator* torpedo bombers and Grumman *Wildcats*.

Some idea of the problem involved may be gained from the fact that these airplanes were required to fly over wild, unexplored mountain jungles whose interior included mountain peaks 13,000 to 15,000 feet high and of which our charts showed little beyond the shoreline. Every airplane except one, which was shot down by antiaircraft fire, returned safely to the carriers.

A scouting squadron was first to attack the harbor at Lae. One large transport at a dock and one in the harbor were sunk by bombs. A third was set afire and was subsequently beached. Two pilots pulled out of their dives and made glide bombing attacks on a cruiser which was attempting to get out of the harbor. A 500-pound bomb struck her squarely abaft the second stack and she headed for the beach burning badly. A minesweeper was also struck and left afire. Ens. J. P. Johnson was lost from this squadron when his plane was shot down by antiaircraft fire.

A torpedo squadron attacked three transports and a cruiser under way off Salamaua. Three sure hits were scored.

A bombing squadron directed six of its airplanes at a cruiser. A direct hit and five near misses sank the cruiser in a matter of minutes. Another division of the same squadron scored direct hits on a transport.

A fighting squadron strafed ships and ground installations at both Salamaua and Lae. A destroyer was badly damaged and probably sunk by machine gun fire, an amazing feat.

Another bombing squadron, led by Lieut. Comm. R. G. Armstrong, dove on two light cruisers and scored three direct hits. A destroyer was then hit and another cruiser attacked.

Fighter planes led by Lieut. Comm. Oscar Pederson strafed surface objectives and small boats in the harbor.

Lieut. Comm. W. O. Burch led this scouting squadron in an attack on two auxiliaries close to the beach at Lae. At least two direct hits were scored on each and they were left beached

and burning. The second division of this squadron sank another auxiliary off Lae.

Torpedo planes made a level bombing attack on the *Kamoi*, a large seaplane tender. A direct hit was scored and the ship was left dead in the water.

Enemy losses were as follows:
2 heavy cruisers sunk.
1 light cruiser sunk.
1 destroyer sunk.
5 transport or cargo ships sunk.
1 minesweeper probably sunk.
2 destroyers possibly sunk.
1 gunboat probably sunk.
1 seaplane tender damaged.
1 gunboat damaged.

Our own losses were as follows:
1 Douglas *Dauntless*, with pilot and gunner, shot down by antiaircraft fire.

Tulagi

On May 4th came the raid on Tulagi, a fitting prelude to the Battle of the Coral Sea, so soon to follow.

In this daylight raid, three separate attacks on Tulagi were made by airplanes from the *Yorktown*. There were Douglas *Devastators* under Lieut. Comm. J. Taylor; Douglas *Dauntlesses* under Lieut. Comm. W. O. Burch and Lieut. W. C. Short; and Grumman *Wildcats* under Lieut. Comm. C. R. Fenton.

In the first attack seven torpedo bombers concentrated on two destroyers and a light cruiser moored at Tulagi. Three direct hits were made; the two destroyers sank and the light cruiser beached herself and sank to deck level. Two other torpedo planes sank a cargo ship.

The dive bombers assisted in the sinking of the destroyers and the cruiser and then attacked another destroyer, a large transport and a cargo ship.

After returning to the carrier, refueling and rearming (which was accomplished so promptly that pilots didn't even have time for a cup of coffee) the attack group left for its second raid. Thirteen dive bombers bombed a seaplane tender, sank several small harbor craft and shot down a seaplane.

Fourteen other dive bombers sighted three Japanese gunboats. The first division of this squadron attacked the rear member of the formation and a direct hit blew it to pieces. The second division dove on the next gunboat with the same results. The third division attacked the leader and damaged it. One bomb hit was scored on a seaplane tender and then the remaining gunboat was heavily strafed. It was later observed to have been beached.

In the third attack, launched early the same afternoon, four Grumman *Wildcat* fighters led the way. They encountered three enemy seaplanes and shot them all down. The *Wildcats* then strafed a destroyer which was left spewing out an oil slick and with her deck ablaze. One section of these fighters became separated on the way back and landed on Guadalcanal Island. The pilots were later picked up by one of our destroyers.

In this third attack, the dive bombers scored hits on a cargo ship and a seaplane tender and sank a small gunboat and several habor craft by machine gun fire.

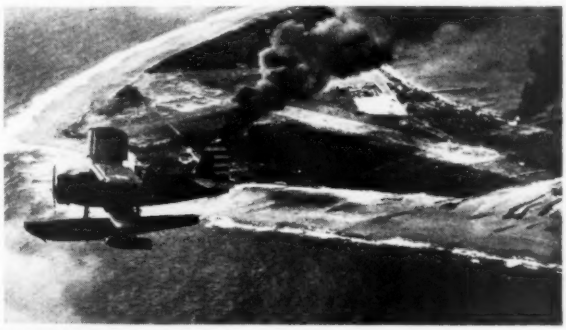
Enemy losses were as follows:
1 light cruiser sunk.
2 destroyers sunk.
1 cargo ship sunk.
4 gunboats sunk.
5 seaplanes shot down.
1 destroyer damaged.
1 seaplane tender damaged.
1 cargo ship damaged.
Several harbor craft sunk and damaged.

Our losses were as follows:
2 Grumman *Wildcats*, pilots saved.
1 Douglas *Devastator*. Crew later rescued from a nearby island.

Coral Sea

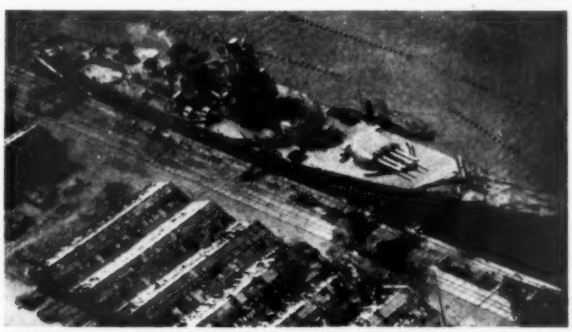
In the Coral Sea, the first week in May witnessed a new kind of naval warfare—an engagement between two great naval surface forces carried on entirely by the air groups of their

WAKE Having dumped its bombs on the Jap-held airport, this "Devastator" circles the scene to take photographs before returning to its carrier out at sea.



MARSHALL First offensive use of U.S. carriers came when the "Yorktown's" planes made this raid. Reconnaissance plane taking pictures is cruiser-based Curtiss SOC.

SOLOMONS U.S. Navy dive bombers blew up this gasoline dump preparatory to first landing operations of the Marines on Guadalcanal. Attacking plane took photo.



AFRICA Damage to French battleship "Jean Bart," docks and warehouses at Casablanca shows thorough job by U.S. Navy. Dive bombers and surface ships did it.

Serious loss was that of the "Lexington" in the Battle of the Coral Sea. When above explosion occurred Capt. (now Rear Adm.) F. C. Sherman (see page 78) still was aboard her.

Grumman "Avengers" (TBF) first were used in Midway battle. Though several were lost, this one, badly shot up and damaged, returned safely to its base. Note smashed-up rear turret.

aircraft carriers. On the 7th of May the *Lexington* and the *Yorktown*, as the spearhead of a U. S. Navy task force, intercepted a major portion of the Japanese fleet which was advancing on Port Moresby. In the two-day air action which followed, the Japanese were forced to abandon their objective and turn back from their threat to a vital United Nations base.

Early on the morning of May 7th the *Lexington* received word that the enemy force had been sighted by a scouting plane. She launched an attack group of Grumman *Wildcats*, Douglas *Dauntlesses* and *Devastators*. Contact was made with the enemy aircraft carrier *Shoho* and the dive bombers roared to the attack. Following two direct hits by the scouting squadron, the bombing squadron made its dive and got five direct hits with 1,000-pound bombs. The carrier was a mass of flames, but the torpedo squadron led by Lieut. Comm. J. H. Brett, Jr., headed straight for her and scored nine torpedo hits. Meanwhile the *Yorktown's* squadrons under Lieut. Comm. W. O. Burch, Lieut. W. C. Short, and Lieut. Comm. J. Taylor, were ready to help in the kill. Their *Dauntlesses* dove down from 18,000 feet and scored 14 hits. By this time the carrier was listing heavily and all but two of its antiaircraft guns were out of action. This enabled the torpedo planes to drop at very close range, and more torpedo hits were scored. Three minutes later the *Shoho* sank beneath the waves, plowing herself under.

During the dive bombing attacks on this carrier, Ens. H. S. Brown, Jr., the last man to dive, saw that the carrier was doomed, and shifted his aim to a nearby cruiser. He made a direct hit with a 1,000-pound bomb abaft the bridge and the cruiser sank within five minutes.

Three dive bombers were lost in the attack on the *Shoho*. Our escorting fighters shot down one Japanese scout bomber and three Japanese fighters.

That evening, close to sunset, the combat air patrols protecting our two carriers intercepted nine Japanese Zeros. The *Lexington Wildcats* shot down four, the *Yorktown Wildcats* got three, and the remaining two got away trailing smoke. Three of our pilots were missing after this engagement.

Early next morning, May 8, Lieut. (jg) Joseph Smith, from one of the scouting squadrons, located an enemy force of two carriers accompanied by cruisers and destroyers 170 miles from the *Lexington*. Dive bombers, torpedo bombers and fighters were launched from both the *Lexington* and the *Yorktown*.

One of the two carriers, the *Shokaku*, was attacked by the *Lexington* group under Comm. W. B. Ault. Two direct hits with 1,000-pound bombs were scored, and then the *Devastators* went in. Five sure torpedo hits were made by Ens. N. A. Sterrie, Ens. T. B. Bash, Ens. H. R. Mazza, Lieut. G. W. Hurst, and Capt. B. C. Shearon. The *Shokaku* was left a mass of flames, settling badly and turning in a circle.

The dive bombers from the *Yorktown* roared down from 17,000 feet on the other carrier, the *Ryukaku*. Six direct hits, and probably three more, all with 1,000-pound bombs, were scored. Zero fighters attacked these dive bombers and, after the pullout, our *Dauntlesses* shot down 11 of them and damaged nine more.

Torpedo planes coordinated their attack with the dive bombers and obtained three certain hits on the carrier. When last seen, the *Ryukaku* was burning fiercely. During the torpedo attack, our escorting fighters shot down three Zeros.

While the attack groups of the *Lexington* and the *Yorktown* were engaged in these actions, a strong force of Japanese dive and torpedo bombers came in to attack our own carriers. This force was sighted about eleven o'clock in the morning and *Wildcats* from the *Yorktown* and the *Lexington* and the remaining *Lexington Dauntlesses* were sent out to intercept.

During the air battle which raged over the two carriers, the *Lexington* was struck by two torpedoes and five bombs. The *Lexington* combat air patrol and antiaircraft fire accounted for 29 Japanese airplanes, 11 having been shot down by *Dauntlesses*. The *Yorktown's* fighters shot down four Zeros and three dive bombers, and damaged four other enemy fighters and two dive bombers.

At 12:47 a heavy explosion shook the *Lexington*. Probably this was due to an accumulation of gasoline vapor in the lower regions of the ship. From then on it was a losing fight to control the fire. Personnel were disembarked to awaiting destroyers and one of our ships was ordered to give her the *coup de grace* with a torpedo. There were no losses of personnel due to disembarkation. The *Lexington* finally went under on an even keel.

Enemy losses were as follows:

1 aircraft carrier, the *Shoho*, sunk, with more than 60 planes estimated on board.
2 aircraft carriers, the *Ryukaku* and *Shokaku*, damaged.
1 light cruiser sunk.
91 airplanes shot down in combat.
Several airplanes shot down by antiaircraft fire.

Our own losses were as follows:

1 aircraft carrier, the *Lexington*, sunk, with 92 per cent of her personnel saved and many of her airplanes

(*Continued on page* 192)

The CARRIER

Nothing in recent years has revolutionized Naval warfare like the U. S. Navy carrier. It has carried the fight to the enemy.

Fighters and dive bombers are signalled off the deck of a carrier.

THE CARRIER

by Rear Adm. FREDERICK C. SHERMAN

The last commanding officer of the now historic carrier "Lexington," Admiral Sherman is the holder of the Navy Cross with Gold Star. Born in Port Huron, Mich., May 27, 1888, he graduated from the Naval Academy in 1910. During World War I he served in submarines, receiving the Navy Cross for heroic action. He had a wide variety of duties prior to the "Lexington."

Naval airmen aboard an Africa-bound carrier spend their leisure time, between regular patrol flights, eating, arguing, studying, reading or playing gin rummy.

THE striking power of the aircraft carrier has been forcibly demonstrated in our battles in the Pacific. The first offensive action of the United States in this war—the successful attack on the Gilbert and Marshall islands—was carried out by carriers moving in swiftly and launching their death-dealing planes from a safe distance, to the costly surprise of the Japanese. Only carrier-based aircraft made attacks on the enemy forces at the battle of the Coral Sea, and at Midway it was carrier-based aircraft that made the kill on three of the four enemy carriers sunk. We were able to advance on the Solomons largely because our carrier-based aircraft gave air cover and drove off enemy ships attempting to interfere with the operations. From the very outset of the war against the Japanese, when they sneaked in with carriers and bombed our Fleet at Pearl Harbor, it has been evident that supremacy in the Pacific was going to rest almost alone on aircraft. This power, in the vast reaches of that ocean, derives its impetus from the carrier, whose role in the fighting today is a relatively new naval development.

As war changes the face of the earth, so does warfare itself change. The implements of fighting are constantly undergoing improvement. In 1862, for example, an engagement took place in the estuary at Hampton Roads that revolutionized sea warfare. The Southern Confederacy, hard pressed by the Northern blockade, conceived the plan of fitting iron plates onto one of her old wooden ships, the *Merrimac*. The device proved so successful that the North developed a cumbersome-looking craft called the *Monitor*, which was more heavily armored than the *Merrimac* and had, besides, practically no freeboard. A skirmish then took place between the *Monitor* and the *Merrimac* that sounded the death-knell of wooden ships, and there began, in the United States and Europe, frenzied construction of armored vessels of all kinds. This evolution resulted in the production, during the early years of the century, of the modern battleship. As a machine fighting on oceans over which the skies were free of aircraft the battleship functioned brilliantly. Its destructive power was terrific—when it was fighting against other ships on the surface of the sea. But with the advent of air warfare, the uses of the battleship began to be increasingly limited, and with dive bombers and torpedo planes becoming more numerous and accurate, the battleship requires an air umbrella wherever it is within range of any enemy aircraft.

The subject is controversial in most of the navies of the world. Some recent developments here at home, however, are quite significant. The Government has ordered work stopped on five battleships in the blueprint stage in order to place carriers first on the priority list of Naval construction. Congress recognized the urgent need for carriers when it appropriated funds for building half a million additional tons and approved conversion of other types of vessels for carrier duty. Chairman Carl Vinson of the House Naval Affairs Committee told reporters, "The modern development of aircraft has demonstrated conclusively that the backbone of the Navy today is the aircraft carrier."

In spite of these moves, we are getting a late start on the building of carriers. In 1915, during an interview of a young Japanese naval officer named Yamamoto by an American writer, the question was asked, "What do you consider *the* war vessel of the future?" Yamamoto's answer was prompt and decisive. "The most important ship of the future will be a ship to carry airplanes," he replied.

That was in 1915.

Yamamoto clung to his naval philosophy and became, at length, an admiral. His name has been mentioned in newspaper dispatches from time to time during the past year. The Japanese navy took his advice and, while publicizing the erroneous information that it was concentrating on "superbattleships," secretly built more carriers than it allowed the world to know.

This insight into the future shape of sea warfare has been borne out by practically all of the actions involving battleships on one side and carrier-based aircraft on the other. Most followers of the war remember the news stories concerning the British ships *Prince of Wales* and *Repulse*, the American ships *Arizona* and *Oklahoma* and the Italian ships at Taranto, to cite a few cases. All these were knocked out by carrier-based planes. The truth is that the uses of the battleship today are circumscribed; it can safely function in the face of enemy air opposition only when given air protection, either from shore bases or carriers. In the latter case, the carrier aircraft might be better employed offensively against the enemy than defen-

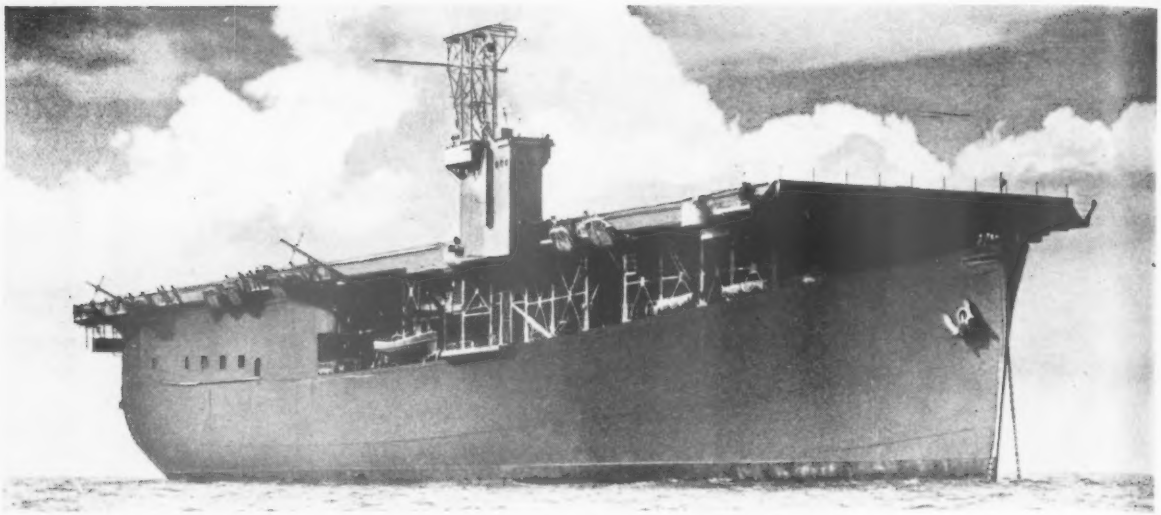
A carrier about to launch her planes is busier than Times Square. Their demolition bombs in their cradles, these "Dauntless" dive bombers are about to be launched. Carriers carry about 2,300 men.

sively protecting the battleship. If absolute control of the air is assured, the battleship may find occasion to venture out as part of a heavy bombardment raiding force; otherwise she will have to remain in port.

In regard to the possibilities of aircraft carriers, imagine, if you can, a task force of 100 carriers, with 5,000 fighters, dive bombers and torpedo planes. Such a force is not improbable; the high speed production methods for which the United States is celebrated could likely place a similar one on the seas in plenty of time to greet the Japanese before this war is over. Imagine, again, this task force smashing against the Japanese-defended bases, clearing the air of enemy planes, rolling over the Jap warships it would find on the way. Preparations would be worked out so that these giant carrier attacks could be launched against the enemy at regular intervals, as the mass bombings of Germany are being done by the English. After

Carriers are equipped to take aboard scout-observation planes after their catapulting from battleships or cruisers.

Time out for sandwiches and coffee for the deck crew of a carrier escorting a convoy to the North African fight.



Now being produced "in quantity" are auxiliary carriers like the U.S.S. "Charger," converted from a merchantman. These are much smaller than first-line carriers, can be used to accompany convoys.

a few task forces of this kind were sent against the enemy, his strength would be dissipated, his fortifications would be blasted to rubbish, and our Army and Marines could follow the Fleet in and occupy his isolated bases. It would be possible to develop, from carriers and captured island bases, a bombing schedule that would see the sky over Japan itself raining death and desolation nearly every day. Occupation forces could be sent in where circumstances warranted. No people could survive this kind of ruinous visitation for long. The Japanese, who have been having a field day with rape, torture and pillage in China, and who slaughtered 3,000 Americans in the surprise attack at Pearl Harbor, would be hammered to their knees and their arrogance and savagery ended for all time.

This program, it will be charged, is fanciful—it sounds too simple. Critics of the carrier will say that it falls easy prey to torpedo and dive bombing attacks. In Chicago not long ago I was asked, "What is the answer to the vulnerability of carriers?" My reply was, "More carriers. More carriers than the enemy." The arguments against this kind of ship are all familiar by this time: it is very vulnerable, it is not maneuverable, its high flight deck prevents its being heavily armored, its flat surface is an easy target, etc. Some of the contentions are, in part, based on fact, but vulnerability is more of a factor in a defensive action than an offensive one, and is of more concern to the nation with the smaller number of carriers. No carrier is positively invulnerable against a determined air attack in numbers superior to her own complement of planes. Yet the *Lexington*, of which I was in command, absorbed all the punishment the Japs could give her in the Coral Sea and still survived. It was not enemy fire that put her out of action; it was an internal explosion of gasoline fumes. During the 17 years of her life the *Lexington* held many records, and her greatest record came in the last few months of her life, in the days following the attack on Pearl Harbor. She went into three battles and her air squadrons accounted for 23 enemy ships sunk or damaged and some 800 Japanese officers and 9,000 men killed or drowned. The nation may well be proud of her record.

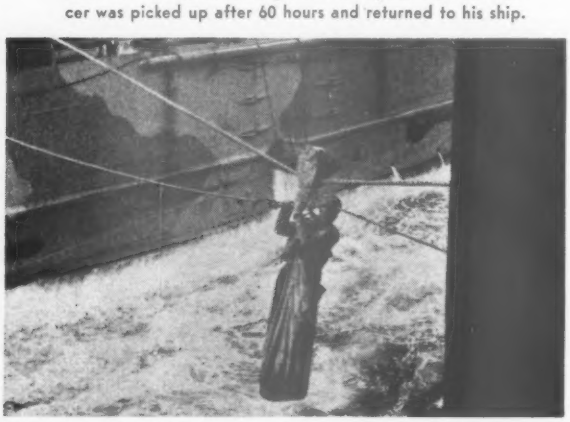
To show just what kind of assault the *Lexington* withstood in her last battle, let me quote from the official Navy press release dealing with her last hours:

"During this same engagement (the Battle of Coral Sea) the enemy launched a counter-attack with aircraft while our planes were still attacking. The principal target was the U. S. aircraft carrier *Lexington*, flagship of Rear Adm. A. W. Fitch.

In spite of skillful handling, all available fighter protection and antiaircraft defense, the *Lexington* was hit by two torpedoes and at least two bombs and was further damaged by several near misses. These attacks were the last action in the battle of Coral Sea. The crew of the *Lexington* succeeded in putting out the fires and recovering her aircraft. Several hours after the battle, while steaming at 20 knots, a terrific internal explosion rocked the

(*Continued on page* 229)

Lost off his carrier during African expedition, this officer was picked up after 60 hours and returned to his ship.



Landing operations on a carrier depend almost entirely on the deck signalman. Pilots watch him instead of ship.

FIGHTER

Often abused by critics at home, our fighters in combat have proved themselves in many ways superior to those of the enemy.

Grumman "Wildcats" aboard their carrier.

THE FIGHTER

The author (center) gives his pilots some last-minute pointers before taking off from an undisclosed land base.

by Lieut. Comm. JOHN S. THACH

Commander of Fighter Squadron Three, Lieutenant Commander Thach is the only one of his rank in the Navy to hold the DSM, awarded him for "the high state of combat efficiency" shown by the destruction of 19 of 20 Jap bombers by Fighting Three in defending a carrier last year. A graduate of the Naval Academy in 1927, he also has served in patrol and scouting squadrons.

THE operation of a fighting squadron is so intricate and so much depends on the ability of the pilot that it is difficult to describe the working of this system that has given us the balance of power in our battles for control of the air. To picture accurately the way fighter pilots do their job, it may be necessary first to outline the routine of one of their days during offensive operations aboard a carrier.

Paradoxically, the day starts the night before. Let's suppose that we are approaching an enemy base. The air intelligence officer has assembled all the information available to him that will have a bearing on tomorrow's action—the location of enemy forces afloat and ashore in the vicinity, the forecast of the weather, the location of primary and secondary objectives—in short, everything that aids in planning a sound attack for the following morning.

Now the commanding officer of the carrier, the air officer, the group commander and the squadron commander are called into consultation for the final decision as to the time and method of attacking the enemy. These plans are laid with attention to the minutest detail on the basis of the information at hand. The mechanics of coordination of the various squadrons of dive bombers, torpedo planes and their fighter protection is set.

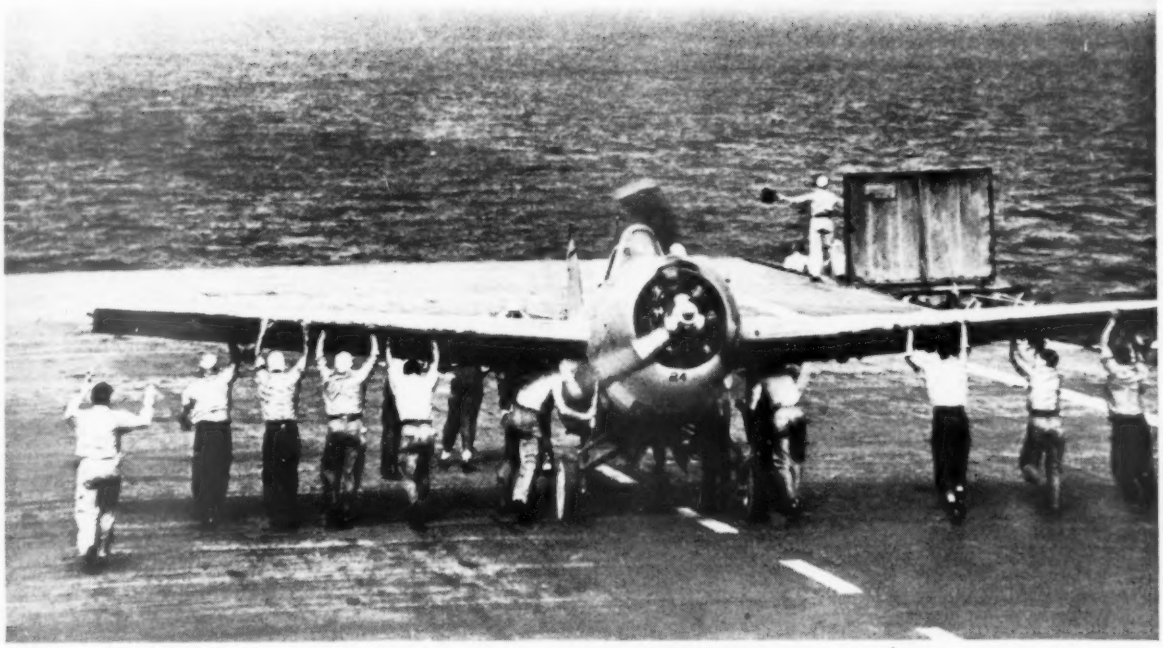
Then all hands turn in, but excitement runs so high that most of the pilots can't sleep. There is too much anticipation, too much mulling over of the details of the plan of attack, to let sleep come easily. By the time they have dropped off, it is usually about time for Flight Quarters to sound—daylight hasn't broken yet—and it's time for a breakfast that they are too keyed up to eat.

Each squadron has its own "ready room," and here is enacted such a scene as takes place in the dressing room of a college football team, with the players listening to the last counsel of their coach before taking the field for the Big Game.

The pilots have been given their information on the general situation. They know the intended course and speed of their squadron and all information they need for navigational purposes. Over the rapid communication system from "airplot," the nerve center of the air department of the carrier, they receive last-minute information up to the time of the take-off.

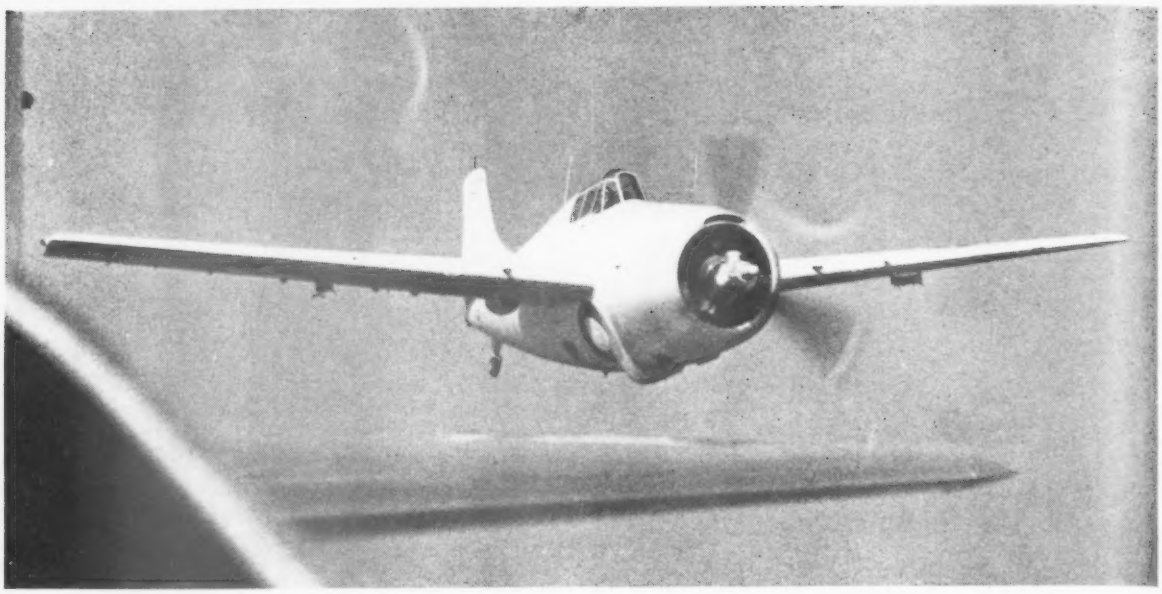
From the squadron commander they hear words of advice, caution against errors committed in practice, admonitions to follow the practices he has taught them. His remarks are delivered to them in semi-darkness, for the lights of the ready room have been dimmed to help the pilots accustom their eyes to the darkness they will encounter outside.

Then comes the order for the fighter pilots of the combat air patrol to man their planes. They take to the air before day-



A "Wildcat" is pushed to the end of a carrier flight deck for take-off, while another is coming in to land.

Latest Navy fighter now in production is the 2,000-h.p. "Corsair" (F4U). It has been called "world's fastest."



Though less maneuverable than Jap Zero, Grumman "Wildcat" box score has proved it an amazingly fine fighter.

light in order to prevent any surprise attack from the enemy, ranging out over the sea on every side of the carrier to clear the way for the attack group.

From time to time, the combat patrol is relieved and other fighters take their station above the carrier. Meanwhile fighters on deck are always in immediate readiness, so that if enemy planes are sighted they can take to the air on the sound of the general alarm. When this happens, the fighter pilot takes precedence over every senior officer of the Navy. Regardless of his rank, he has the right of way over everybody else as he makes for his plane, tearing up ladders and sprinting along companionways. His warning shout of "Gangway for a fighter pilot!" will make an admiral stand aside to let him pass.

When the combat patrol is on its way the attack group takes off, their bombs and torpedoes carrying sarcastic messages to the Japs—along with considerable TNT. "Here is some more scrap iron," and "Listen to this one. It'll kill you!" are a couple of epistles written on the missiles.

First contact is usually with long-range enemy scouts and, as soon as they are known to be in the neighborhood, the fighters go to work. The job of intercepting them is seldom an easy matter, particularly if there are clouds in the vicinity, for the scouts are adept at taking cloud cover. The trick is to entice the enemy out into the open where he can't duck back into a cloud. Once he is out in the sunshine, he is in grave danger—and not from sunstroke. The only question in the fighter pilot's mind is whether the scout will flame before he hits the water.

It is the job of the intercepting fighter to get the enemy scout before he can send a contact report back to his base, if possible. Sometimes it can't be done, but the hope that the enemy can be knocked out before supplying his pals with information keeps the fighter pilots from dawdling before making the kill. If he can stay alive long enough to radio our probable position, the chances are that we will have callers before long.

And on this particular occasion [Editor's note: one of the early Pacific battles] we do have callers—a wave of nine Mitsubishi land-based bombers, who come out and head straight for our carrier. Their scout has done his work well.

We happen to have two divisions of fighters in the air, one which has just taken over and the other already in the landing circle, ready to come on deck—almost out of gasoline. Both divisions climb rapidly into position and get into the fight. They knock down two Japs on the first pass. One is the leader of the enemy attack, but the Japs close up their formation and keep steaming right on in.

Our antiaircraft opens up on the attackers and our stand-by fighter division gets into the air. All fighter divisions intercept before the bombers reach the release point. The result is that we get them all except one and no hits are scored on the carrier by their bombs. We chase the lone survivor until we hear on the radio that a second wave is coming in, so we move to intercept this new adversary.

One two-plane section of the combat patrol intercepts first and, as they make contact, the wing man's guns jam, which leaves the section leader with not a thing in the world to do except shoot down nine planes before they reach the release point. He gets five before the other fighters catch up with him and take the rest of the attackers off his hands.

Three planes drop their bombs before we shoot them down, but the captain of the carrier veers his ship when the Japs reach the release point and the effect of the bombing is minimized. The bombs drop astern, but even so, it is no picnic on deck, because one fighter division is now out of ammunition and another is out of gas. They have to come aboard, and with bombs dropping around him, the signal officer is standing at his station, bringing the fighters in, one after another.

It is three o'clock before the Jap bombers are all submerged, and while our planes are being refueled and checked we have sandwiches and coffee sent to us in the ready room. Our appetites are still a little sketchy and we are inclined to jabber about what kind of attacks we made and what the enemy's avoiding action was, and everybody has a personal horror story to tell.

There are two empty chairs in our ready room. One pilot was killed in action and another parachuted to safety near one of our destroyers, with 30 bullet holes in his body but with presence of mind enough to wigwag recognition signals as he floated into the sea. He'll be back as soon as they patch him up.

Now the squadron leaders succeed in calming the pilots down so that the air intelligence officers can piece together their combat reports and get a coherent picture of the battle. They also have a few terse words to say about sins of omission and commission.

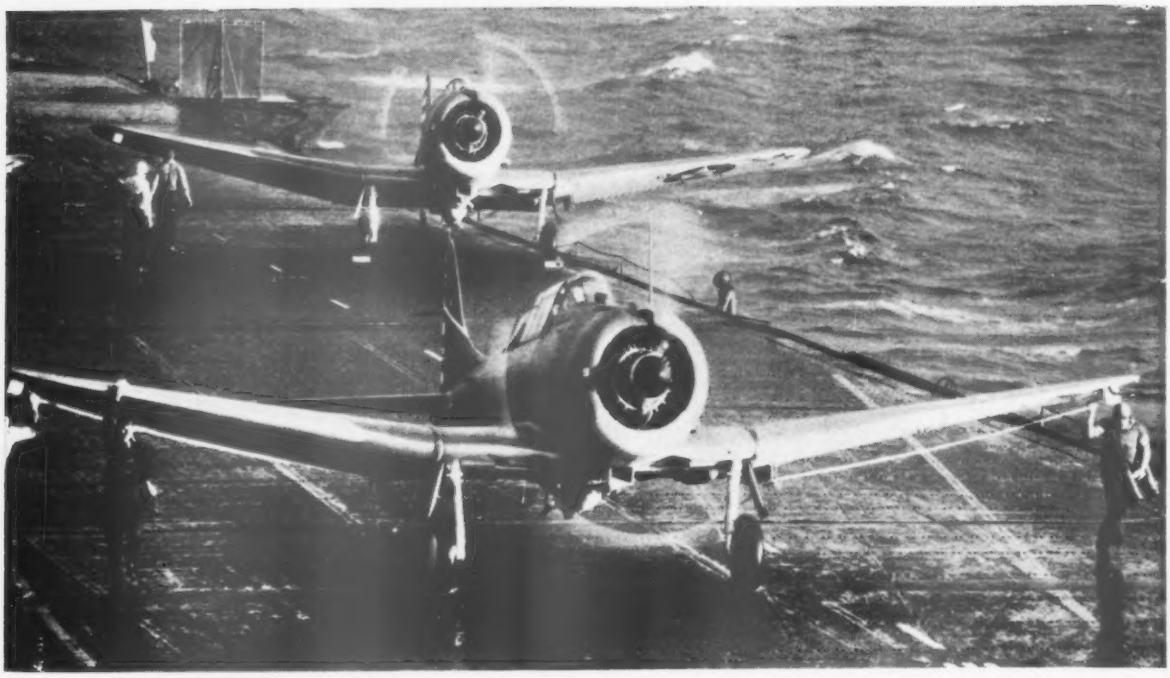
Then word reaches us that a destroyer has sighted a snooper, apparently scouting the fleet from some cloud banks within range of our fighters. We are itching to get at him and hoping there's more than one scout there, so we streak out and spend the remaining daylight time looking for him around and about the clouds. We don't find him—maybe he was just the creature of some lookout's imagination—and when it begins to

(*Continued on page* 244)

SCOUT BOMBER

Some of the most outstanding U. S. Navy exploits and battle successes have been credited to the dive bomber.

Douglas "Dauntlesses" patroling the convoy to North Africa.



"Dauntless" scout bombers taxi down the deck of their carrier to take off for dive bombing attack on Jap ships.

SCOUT BOMBER

by Col.
IRA L. KIMES

Colonel Kimes recently was awarded the DSM "for exceptionally meritorious service in a duty of great responsibility as commanding officer, Marine Aircraft Group, before, during and after the Battle of Midway, June 4 and 5, 1942 . . ." Born at Fayetteville, Tenn., in 1899, he graduated from the Naval Academy in 1923, and became a Naval aviator in 1928.

SIX distinct phases of the war in the Pacific have amply demonstrated the deadly striking power of the scout or dive bomber, but it was in the Battle of the Coral Sea that this American-invented warplane really came into its own.

During the passage of our task force from its base to the scene of the memorable Coral Sea action the scout bombers ably executed the mission for which they originally were designed, namely, scouting far in advance of the fleet to insure its security against any possibility of surprise attack by enemy forces.

They made contact with the enemy first when Jap scouting planes—"snoopers"—were encountered and reported. They scouted Tulagi Harbor and sent or brought back the information regarding the concentration of Nipponese shipping there upon which the plan of attack was based.

Then, freed of their scouting missions, they loaded their bomb racks and proceeded to blast into oblivion the enemy objectives which they had so recently located. In a period of less than 12 hours, the Japs suffered a loss of 14 warships and transports. As in some of the other operations in the Pacific, the scout bombers shared honors with other carrier-based types, but there is no denying that they shared them "honor for honor."

U-boat reported on African trip is bombed by an SBD.

Then, only two days later, came the engagement between our force and the main Japanese force moving down toward the Solomon Islands. Here again the scout bombers were engaged and made first contact with the enemy while the latter were yet approximately 250 miles away. As before, information garnered by the scout bombers formed the basis upon which the plan of action was built. Early the next morning these same scout bombers dropped the word "scout" from their destination and again took off loaded with bombs. Soon came that historic report of the scout bomber squadron commander: "Scratch one flat-top!" Still later, that same individual reported it made him physically ill to see the bombs ripping into the enemy carrier.

Although the dive bomber, developed by Americans, has been copied—and used against us—by both the Japs and the Germans, its signal successes in the hands of our pilots makes it an especially timely subject for closer examination.

As its name indicates, the scout bomber is an airplane that is intended for scouting or bombing. It is a single engine, two-place airplane, i.e., it carries a pilot and rear seat gunner, and is designed for operations from an aircraft carrier. Such operations require that the scout bomber have incorporated in its construction certain necessary special equipment to permit landing aboard aircraft carriers. The high stresses imposed upon its structure incident to such operations, together with

Because of strict radio silence on wartime operations, "Dauntless" drops written message on deck of its carrier.

those imposed by recovery from steep, high speed dives, further accentuates the need for strength. For these reasons, scout bomber airplanes must be very ruggedly constructed. This rugged construction has, in a number of incidents in the present war, proved its great value for reasons other than those mentioned, as is evidenced by one particular incident when one plane of this type flew home with 214 bullet holes in it.

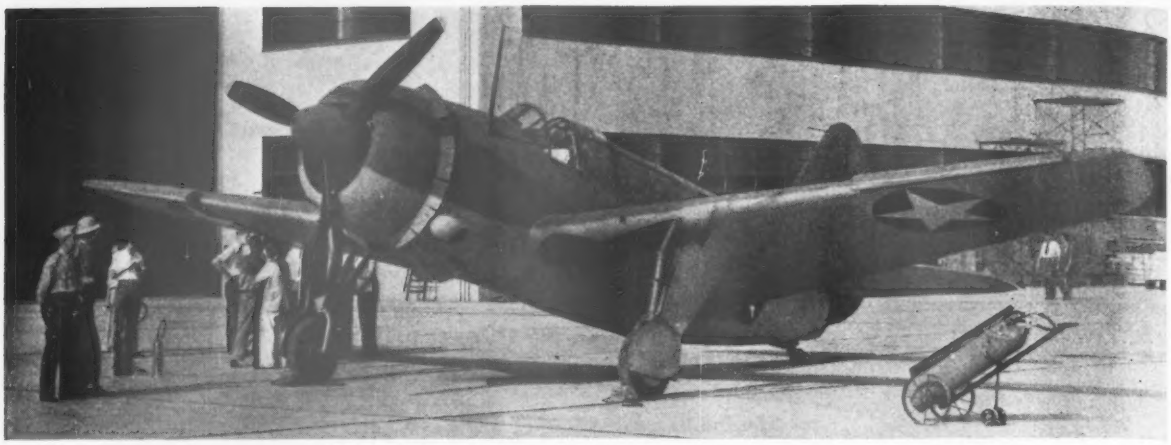
The development of the scout bomber, often also referred to as the dive bomber, has extended over a considerable period of time. Records fail to show exactly when diving was first employed as a maneuver from which bombs were discharged at a target. Indications are, however, that this method of attack was first used by the Marines in Haiti. Prior to this, during World War I, shallow dive or glide bombing has been widely employed, but no true steep dives had been used. It might be of interest to note that fighter airplanes are also equipped to do dive bombing, though, of course, they do not carry as heavy bombs as the scout bombers.

The scout bomber of today more nearly stems from what formerly was known as the observation plane. The first departure from the practice of using observation planes for scout bomber missions was the design and production of the SU-1 airplane. The F8C-4 was the first airplane in the design of which its probable use as a dive bomber was one of the controlling factors. Then followed the BM's, BG's, and SBU's, this latter being likely the first of the carrier scouts and dive bombers; that is, the first scout bomber as we now think of them. Others are the SBC, the SB2U's, and the SBD's, with the SB2C's and the SB2A's the latest models out.

Scout bombers may be employed on purely scouting missions, on search attack missions, or on purely attack missions. When employed on purely scouting missions, additional gasoline is carried instead of a bomb load, thereby greatly extending the radius of action of the aircraft. Under these conditions of loading, the scout bomber possesses no offensive power, other than that of its forward firing fixed machine guns, and its mission is purely one of scouting for information of the enemy or his positions. If it is desired to employ the scout bombers on a search attack mission, i.e., missions on which an attack is to be delivered after the enemy has been located, it becomes necessary to make a choice in loading. The airplane may be operated with its full gas load and reduced bomb load to maintain its maximum radius of action, it may be operated with maximum bomb load and reduced gas load, with resultant reduced radius of action. Or it may be operated in an overload condition, in which condition the maximum bomb load is carried together with the necessary gasoline to provide for the maximum radius of action. It is not desirable to operate the scout bombers under this last condition, but circumstances often make it necessary.

Essentially, dive bombing is just what the name implies, release of bombs from an airplane while in a dive. However, it is not so beautifully simple as that. In order to hit con-

"Dauntlesses" at Battle of Midway. Note burning Jap ship.



Navy's newest scout bomber is the powerful Curtiss "Helldiver" (SB2C), soon to go into service with the Fleet.

sistently, it is necessary to use approximately the same angle of dive since variation in this angle causes variation in the point of impact of the bomb along the line of the direction of the dive. It is equally important that the airplane is not skidding at the instant of release. Skidding at this important instant will result in the bomb going wide of the target, to one side or the other, i.e., in deflection.

There is still more to consider. Allowance must be made for the wind relative to the target, since this wind will be acting upon the bomb from the instant it is released from the airplane until it strikes the target. If the target is a moving one, such as a surface ship, allowance must be made for its course and speed. A few moments' reflection on the above will at least indicate that the dive bomber pilot never lacks for something to do.

The occupant of the rear seat, usually referred to as the gunner, mans the free or flexibly mounted machine gun in its especially designed mount in the rear cockpit. It is the gunner's duty to defend his airplane from attack from the rear. In addition to this, he is assigned a large part of the communication duties, particularly if it be by "key." If it is necessary or desirable to use radio navigation aids, he must also play an important part in the use of these aids.

The pilot is charged with the employment of the airplane as an offensive weapon on the mission that has been assigned the unit of which he is a part. In the execution of this mission, he employs his bombs and his forward-firing fixed machine guns. His method of delivering his bombing attack is, of course, dive bombing. Hence we have heard the scout bomber more often than not referred to as a dive bomber.

So, having considered briefly the scout bomber from the standpoint of some of its characteristics, the history of its development, and its employment, let us see what the contribution of this type has been toward winning sea battles.

Before proceeding to consider the accomplishment of the scout bomber in the present perhaps it might be well to examine our conception of a sea battle, revising it, if necessary. Sea battles are, in one sense, just what the name suggests—battles fought at sea. This, of course, implies the use of naval forces by both sides. But suppose we ask why are sea battles fought? The answer is, of course, "for control of the sea."

(*Continued on page* 280)

Ens. DeClinton Nichols, typical scout bomber pilot, back aboard his Africa-bound carrier after a scouting mission.

Dive bomber keeps eye out for trouble while U. S. landing barges (left center) enter harbor at Safi, French Morocco.

SCOUT OBSERVATION

The SO pilot is the long-range eye of the Fleet. He pierces the enemy's line to unvail their movements. His quick warning may lead to a spectacular victory.

by Comm. M. K. FLEMING, Jr.

Now assigned to the VOC-VSO design office in the Bureau of Aeronautics, Commander Fleming has been a pioneer in mass flights. After his graduation from the Naval Academy in 1926, he won his wings at Pensacola. After Fleet duty, he returned to the Academy in 1933, for post-graduate work. In 1936, C.I.T. awarded him a master's degree in aeronautical engineering.

IN MOST of the Naval engagements of World War II, the observer and scouting pilot has played a key role. It is a role as vital as that of any combat pilot, and sometimes even more hazardous. The success of one recent South Pacific action was due chiefly to the daring of a scout plane crew. Flying several hundred miles into the enemy area, they discovered a large Jap task force headed for the Solomons. Under fire, and pursued by Jap fighters, the pilot climbed into clouds and radioed a warning to his ship.

Quick maneuvering by the Navy surface forces resulted in one of the most spectacular victories of the war.

During the first phase of the African campaign, a Naval observation plane was attacked by three enemy fighters while spotting hits for a battleship. Ducking in and out of the clouds, with a clever pretense of panic, the pilot led the Axis fighters back toward his ship.

At the last moment, he dived out of a cloud, the three planes on his tail. Antiaircraft gunners opened up before the enemy pilots could pull out and in two minutes all three fighters had been shot down. Then the observation pilot calmly went back to his job of spotting for the big guns.

There are other instances, involving standard scout-observation seaplanes or larger patrol planes. The spotting and trailing of the *Bismarck* is perhaps the best-known case. Allied scout pilots, by constant "death watch," keep other Nazi vessels bottled up in port. High-altitude Navy scouts, flying over Jap-held island bases, have brought back photographs used in planning important attacks.

Some of the scouting work is monotonous routine—but still vitally important. The area around a task force must be constantly searched for enemy submarines. A ceaseless vigil over shipping lanes and convoys must be maintained to keep supply lines open.

The scout-observation pilot must be a jack of many trades—and master of all. He must be, first, a Naval officer qualified for officer-of-the-deck and other duties aboard ship. In a surface engagement, or in bombardment of an enemy base, he may be spotting hits for the heavy guns. To bring them on their target, he must have a close knowledge of gunnery and fire-control.

Four OS2U "Kingfishers" on practice flight in vertical echelon formation. When possible, the SO pilot will evade combat, confining his activity to the main function of spotting the enemy.

The "Seagull," one of the Navy's newest pontoon-equipped scout observation planes. Developed by Curtiss, this SO3C can be launched by catapult from battleships and cruisers. It is powered with a Ranger engine, but performance data are restricted. Note the upturned wing tips which distinguish this new Monoplane.

In case of attack by enemy subs, the observation plane temporarily may become a dive-bomber. Each pilot is taught this technique to be able to box a crash-diving submarine with depth charges. Both he and his observer must be skilled gunners, able to strafe enemy deck or ground forces in an emergency, as well as to drive off attacking planes.

Wherever possible, however, the observation-scouts evade combat. Their main function is to serve as the eyes of the task force or combat ship. These planes are built ruggedly to withstand rough water landings; they are necessarily slower than fighters and their armament and protection are somewhat reduced to give longer range. Their job is to look—and run.

After spotting an enemy force, observation pilots usually head for the nearest clouds, to shake off enemy pursuit. But their immediate duty—even before defense of their lives—is to flash their information back to the task force.

Such moments, of course, are the exception in the life of the average observation-scout pilot. The routine is nine-tenths hard work, based on intensive training. Training must be as nearly complete as possible; there is little opportunity for practice once aviation units are based aboard ship. Scouting and anti-submarine patrols begin the moment the anchor is raised and continue until it is dropped.

Pilots spot submarine's reported position on map. While their planes warm up, the flyers will carefully chart their course to track down U-boat seen off New England coast.

When a new battleship or cruiser is to be commissioned, its aviation unit is assembled under the command of a pilot with some ship-based experience. In following weeks, pilots and mechanics assemble spare parts, condition new planes, test ordnance and radio equipment and arrange workshop space aboard ship.

When the parent vessel is commissioned the unit moves aboard. During the shakedown cruise it becomes a smoothly functioning part of the ship. Fledgling observer pilots are combined into an efficient team, able to carry out anti-submarine flights and long-range search missions.

Operations are carried out in all but heaviest weather. Even the certainty of a crash landing on the return is not permitted to delay a flight for vital information.

Catapult operations have been raised to a high degree of efficiency in the years since Lieutenant Ellyson made the first successful "shot" at the Washington Navy Yard. Plane crews and catapult tenders are drilled to swift precision in launching, where minutes lost can mean the failure of a mission.

Recovery of observation planes likewise has been brought to a fine art. Pilots land in heavy seas which would have wrecked the earlier models of scout planes. Details of these operations are restricted, but it is no secret that retrieving of planes can be done without serious loss of a ship's speed, or a major change of course.

Under war conditions, it is sometimes necessary to sacrifice observation planes heavily damaged in landing. Even those retrieved are often battered by the waves or at the moment of impact. The corrosive action of salt water on metal alloys also requires daily attention, and both pilots and crews work day and night to keep their planes in flying condition.

Another phase of scouting is performed by shore-based patrol squadrons, especially those operating along our coasts. Day and night, they keep watch for enemy submarines or raiders, some of them flying hundreds of miles at sea. The sharp reduction in ship sinkings along the Atlantic coast is in a large part due to the efficient network of the Navy's seagoing aerial patrol.

END

PATROL BOMBER

When not hunting down U-boats, the Navy's big flying boats range far out to sea, always searching out the enemy.

"Catalinas" being serviced "somewhere in the North Atlantic" by a seaplane tender.

PATROL BOMBER

by Comm.
T. R. FREDERICK

Commander Frederick, born in Washington, D.C., in 1904, was graduated from the Naval Academy in 1926, after which he spent two years at sea on destroyers. He then won his wings at Pensacola. He has served on carriers, with patrol squadrons, as instructor at Pensacola and at the San Diego Naval Air Station. He now is in the patrol bomber design section of the Buaer.

THIS first year of the United States at war has brought about a renaissance in Navy patrol bomber airplanes. This era of improvement does not concern so much the basic concept of the uses to which these airplanes will be put as the changes in the airplanes themselves and the addition of new models, some of which have no previous background of Naval experience. Such acceleration of development always occurs during a war and again proves the old adage that "necessity is the mother of invention."

This does not mean that we are scrapping our present models in existence and in production. Far from it. It means that we are realizing we must have special tools for each job. A golfer can go around a course and use only one club. But if he's up against an expert opponent he'd better take his whole bag of clubs along and use the right one at the right place at the right time.

The Navy arrived at the threshold of war with a patrol bomber which had taken 30 years to evolve. We had one basic bomber—one golf club. The good old PBY, a seaplane, was the backbone of the patrol bomber Navy. Of course, production of other models was under way, but deliveries were only trickles where now they are large rivers and beginning to swell into torrents.

We have in a short space of wartime learned that, besides needing a quantity of tools, we also need some of different kinds. We are up against expert opponents. We need, first of all, landplanes—some patrol landplanes for scouting the wide areas of the oceans, some bomber landplanes to destroy naval objectives on land and sea. We also need seaplanes for the same purposes. We are now getting both.

Let us pause a minute to see what kind of an airplane can be classed as a patrol airplane or a bomber airplane. Either model can be a multi-engined landplane or seaplane, ranging in gross weight from 30,000 pounds to 140,000 pounds. A patrol airplane is usually smaller than a bomber airplane and almost without exception has two engines ranging from 1,000 h.p. to more than 2,000 h.p. It must have large fuel capacity for long range work. It need not be a high altitude airplane, but it should be a fast one. It must also have adequate defensive protection, power-operated gun turrets, armor and self-sealing fuel cells. Last, but not least, it must be capable of carrying a large quantity of depth bombs. A bomber airplane, on the other hand, must carry a heavy load of bombs a long distance at high speed and drop them from a high altitude. It will be larger than the patrol airplane and will probably have four engines of the same power as patrol plane engines. It is vital that this airplane have adequate armament, armor and self-sealing fuel cells for protection from enemy aircraft. Both models can carry bombs (including depth bombs), mines and torpedoes.

The landplane is of course faster and somewhat easier to service and maintain than the seaplane. The seaplane, however, can operate from areas where landing fields are not immediately available. During the course of this war they are being found useful in certain battle areas. The modern landplane bomber requires a solid runway of considerable length. At Guadalcanal only one landing field is available. The side possessing this field controls a vital strategic area of considerable size. This seems to be a slim thread to depend on. It is my conviction that while landplanes will be needed for most operations in most places, seaplanes must not be discarded. They are needed to complement the landplanes.

What airplanes now fit into the general description given above? In the landplane category the Navy has the PB4Y-1 (the *Liberator*), and the PV-1, 2 and 3, (Navy version of the Vega *Ventura*). In the seaplane category the PBY-5 (the *Catalina*), the PBY-5A, (an amphibian version of the PBY-5), the PB2Y-3 *(Coronado)* and the PBM-3C *(Mariner)*. There are several new designs of both categories which will be available to our forces in the near future.

What jobs do we have for these planes?

First we have the long-range patrol mission—the obtaining of and supplying to the force commander of early, accurate, complete and continuous information of the enemy, whether engaged in offensive or defensive operations. At Midway, the discovery of the Jap invasion fleet in time to dispose our own forces so they could attack the enemy before he had a chance to seize and establish a base is an example of the type of successful patrolling.

There are other types of patrol missions, such as anti-submarine patrol and convoy guarding. This all-important work of patrolling the United Nations sea lanes goes on ceaselessly —in fair weather and foul, in summer and in winter, from the far bases in Iceland, Greenland, Newfoundland, Alaska and the Antipodes. With sharp-eyed crews and a load of depth bombs, the patrol planes escort our surface ships through sea lanes that are menaced by enemy submarines.

Along with the anti-submarine patrol there is a secondary mission which follows as a corollary—that of rescue. The crews of sunken ships are now seldom adrift for long periods. In most cases, the pilot of an airplane discovering some survivors will report their location and remain in the vicinity until a rescue surface vessel arrives. However, many cases have been recorded in which the ocean was calm enough for the pilot to risk a landing—a perilous affair in the open sea, even for a large seaplane. The survivors in many cases have been picked up and flown to safety. In one instance in the Caribbean as many as 21 persons were rescued by a PBY airplane. There are many other episodes which could be cited.

One rescue is so unusual, I'm going to quote from an account I read recently:

"The commander of a PBY-5 patrol plane, Lt. A. Y. Parunak, USN, recently accomplished a daring Arctic rescue of an Army *Flying Fortress* crew after the *Fortress* had been forced down on Greenland's barren ice cap.

"American planes are flying by the sun and stars to all points of the compass in the global war. It has become routine for our far-ranging bombers. Routine, too, is the constant watch maintained by the Navy along these unmapped air routes—until something happens. Then the routine is changed to a task that may never have been performed before. Such a task faced Lieutenant Parunak when his seaplane base heard a weak radio message coming from the Greenland ice cap—a vast land of icy plateaus crossed by 10,000-foot mountains of ice. An Army B-17 was down on the cap!

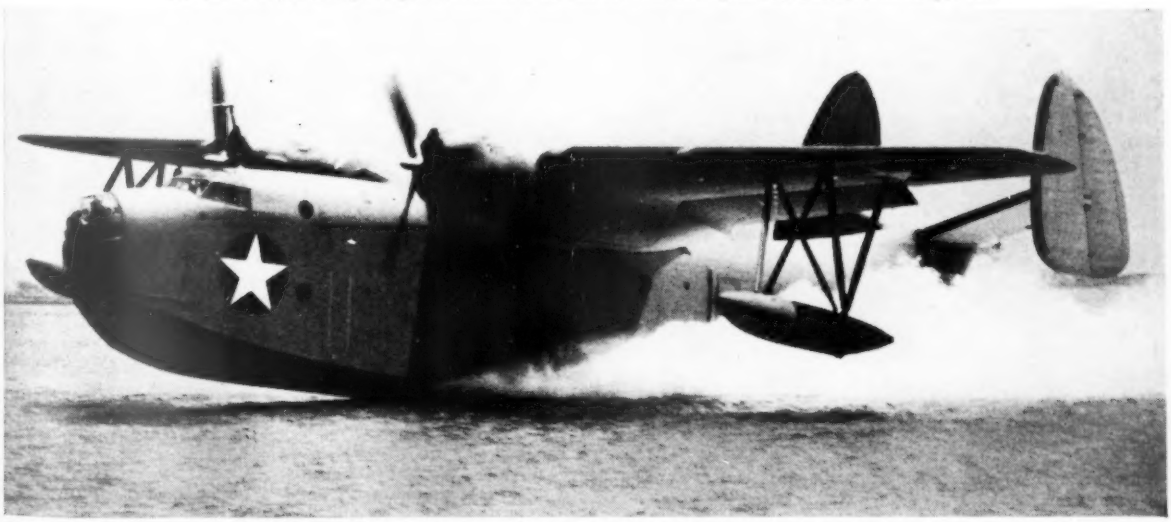
"An aerial search by flying boat soon located the *Flying Fortress*, with its crew of 13 uninjured. They were down only 100 miles inland from the Navy base, but the problem of rescue was made difficult by the sun turning the plateau to slush during the day and the cold nights bringing steel-hard ice. Criss-crossing the plateau were thousands of bottomless crevasses. Only Alpine experts could cross the rocky ranges on foot. The B-17 crew would have to be flown out, but no plane had ever safely landed on or taken off from the ice cap, let alone a seaplane, the only type in Parunak's command. Planes could make forced landings on the pleateau—the B-17 had proved that—but never had one taken off. No plane had ever tried, Lieutenant Parunak reasoned, and a PBY, the Navy's flying workhorse, might do it somehow.

"Food, Arctic sleeping bags and other supplies were dropped

Biggest flying boat patrol bomber in the Navy is the four-engined Consolidated "Coronado" (PB2Y-2).

Lately in service with the Navy as its PB4Y patrol bomber is the Army's famed Consolidated "Liberator."

Standard Navy twin-engined patrol bomber is the Martin "Mariner" (PBM-3), also used for cargo work.



Most famous of all patrol bombers is Navy's Consolidated "Catalina" (PBY-5), still used everywhere.

Twin-engined landplane patrol bomber is the Lockheed PBO-1, same as "Hudson" and Army's A-29.

from the air to the B-17's men—everything needed except snow shoes.

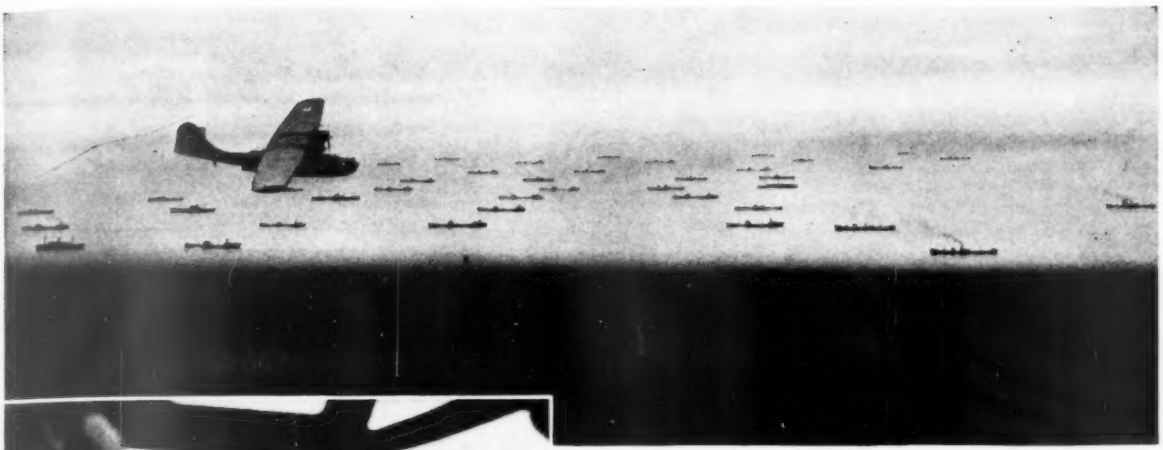
"Lieut. Col. Bernt Balchen, the famous Arctic pilot, in command of a nearby Army base on Greenland, advised against snowshoes. 'Men have a bad habit of wandering off and getting lost,' he explained. 'Keep them put in one place if you can.'

"For one week the B-17 crew stayed put while Parunak made survey flights to study the situation. Then a 'miracle' happened—a 'dimple' on the ice caps about 12 miles from the B-17 was filling with water running off from the icy slopes that cupped it. From the deep blue color of the water, its depth was estimated as sufficient for a PBY to land. A series of timed speed runs gave the length of the water line as 1.8 miles, just barely enough for a takeoff at the 4,200 feet altitude of the 'lake.'

"The 'lake' was discovered on July 3 at one p.m. Lieutenant Parunak returned to his base, stripped his airplane of everything removable except the radio, loaded it with equipment for a base camp, just enough gas for the round trip to the 'lake,' and, finally, snowshoes for the stranded crew. Every man in the crew and the rescue party knew the gamble facing them when the heavy *Catalina* settled on the 'lake.' They had no doubts about the plane or its pilot. But the 'lake' might not withstand the sudden shock load of the 15-ton plane on its surface. The bottom of the 'lake' was only a thin crust of ice covering numberless crevasses. If the crust broke, the water would drain out and the *Catalina* would be stranded —which could mean eventual disaster for both plane crews. For minutes after the landing, everyone watched the water line. It was holding. The first intentional landing on an ice cap 'lake' was a success.

"The Army rescue party were put ashore and a base camp set up. Then Lieutenant Parunak took off and dropped the remaining supplies to the B-17 crew and returned to his Navy patrol base. This concluded operations for July 3.

"Then a storm came up to make it even tougher for Colonel Balchen's party fighting their way on foot against sudden rivers of water, soft ice crusts and crevasses that would split open in thunderous cracks almost under their feet. They finally reached the B-17 on the morning of July 5. Colonel Balchen's men were snow veterans and were on skis, but the B-17 crew were to walk out on snowshoes, easier for them than skis, and Colonel Balchen knew they couldn't stand the



This is the patrol bomber at its comparatively unspectacular work. The "Catalina" flies herd on huge convoys in all weather. The PBY pilot (left) flies past a U. S. warship in the convoy.

return trip unless it was made quickly. 'Snowshoe cramps,' if nothing else, might stop them. Or a storm might break in the sudden way of Greenland's weather, or, worst of all, a crevasse might open and drain the 'lake' like pulling a stopper in a wash bowl.

"Time was precious. A message had to be sent to Parunak, but the radio battery was dead. So the propeller blades on one engine of the B-17 were cut to allow the engine's operation and the battery was recharged. Colonel Balchen radioed Lieutenant Parunak to guide them over a higher, shorter route back to the base camp at the 'lake.'

"At 4:30 p.m., July 5, the return trip started. From his plane overhead, Lieutenant Parunak sketched maps of the conditions ahead and dropped them to the party as it progressed. In this way they were guided away from traps between crevasses and from the water pools and rushing torrents that spread across the ice cap. The B-17 crew had started out with little realization of what they were facing. They loaded up with their personal luggage and smaller items of valuable equipment and proposed to cart the things out. These pieces were all discarded the first mile and soon Colonel Balchen's veterans had to prod the B-17 crew along to keep them awake. Luckily, Colonel Balchen insisted they be tied together with an Alpine rope. One man broke through the crust to dangle over a bottomless crevasse.

"After the 12 miles to the 'lake' were covered they found the 'lake' was now less than one mile long. Ice had formed and drifted against one shore to cover about half the lake.

"Lieutenant Parunak landed the PBY, quickly loaded on eight survivors and with all the power available and all the prayers they could think of, got the PBY off. He credits his co-pilot with getting the last needed horsepower out of the engines by skillful manipulation of the throttles.

"The next trip was not so difficult because the whimsical weather had lengthened the water line of the lake. The remaining men were flown back to the Navy base. And the next day the 'lake' had disappeared down a freshly opened crevasse.

"Another incident soon occurred which caused Lieutenant Colonel Balchen and Lieutenant Parunak to call their teamwork rescues the 'Greenland Co-operative Salvage Company.' About two weeks after the B-17 rescue, an Army plane, used for close-in patrols, was forced down on the edge of the Ice Cap. It was located on the shoreline of a glacier. Several survey flights gave the 'Greenland Co-operative Salvage Company' a good estimate of the situation. Reaching the plane on foot would require about two weeks for the round trip.

"This plan had to be discarded, for it was evident that the pilot, Col. Robert W. C. Wimsatt, AAF, former operations officer at Bolling Field, Washington, D. C., was injured. He was seen to remain in the cockpit while his sergeant picked up supplies that were dropped from Lieutenant Parunak's *Catalina* down between the canyon walls. Two weeks might be too long.

"Again a lake was located, about four miles from the plane. This one was permanent, which did not make it altogether safe. From the air it was impossible to tell whether or not

Patrol bombers spend long, tiring hours in the air. These crewmen are having lunch after serving the pilots up front.

there were rocks just below the surface that would stave in the *Catalina's* hull. The water in the lake was 'glacier milk,' a cloudy, milk-like color caused by rock finely powdered by glacial action. Just one more hazard was a number of small icebergs in the lake.

"A landing had to be tried to find out if it could be made. With that accomplished, again a base camp was set up ashore and Lieutenant Colonel Balchen, this time with a doctor, set off on foot to the rescue. Lieutenant Parunak decided to wait on the lake for his return. This would avoid the risk of an extra landing and takeoff on the unknown water. That night was spent busily warding off icebergs that drifted down on the mooring.

"The rescue party returned in the morning with Colonel Wimsatt who had been severely injured in the forced landing.

"The 'Greenland Co-operative Salvage Company' flew him home to safety."

Let's go back to some of the other jobs we have for our patrol bombers.

Bombing Naval objectives afloat and ashore is the primary mission of some of them. To bomb a fast-moving, maneuvering ship is not easy. It is infinitely harder than bombing Naval land objectives. In both cases the bomber will likely be under antiaircraft fire or enemy fighter attack, or both. The horizontal bomber will therefore have to be fast and attack from medium altitudes. It will need adequate defensive protection. Horizontal bombing of Naval targets, especially moving targets, has not been too successful in the Naval phase of the war so far. We have found that near-misses or very near-misses are disconcerting but not devastating. Direct hits are hard to get. However, as we gain experience I think we shall hear more about the success of horizontal bombing. It was interesting to note a recent press release which described night bombing attacks by *Catalinas* in the New Britain area of the Southwest Pacific.

Another type of offensive use for our planes is the torpedo attack. It has been said that the torpedo is a weapon of opportunity. However, it has been amply demonstrated in this war that the opportunity can be created by careful planning, making use of the knowledge gained by our scouts. In the battle of Midway four *Catalinas* made a successful night torpedo attack on a portion of the Jap fleet and scored a hit on each of two large ships.

In the European theater patrol bombers have been effective in mine laying operations. A large amount of German shipping has been sunk by mines laid by British aircraft. Aircraft mine laying will undoubtedly come into increasing prominence in other areas.

A final use for our patrol planes—especially important in this worldwide war—is that of Naval transport. The patrol airplane can be quickly changed to a cargo airplane simply by removing all or part of the military equipment, depending on the route concerned, and installing facilities for carrying cargo. Many Navy patrol bombers already have been so converted, and large amounts of important cargo are hauled every month.

How did the Navy come to require large shore-based landplanes? Back at the beginning of this article I spoke of the 30 years of development which resulted in the seaplane patrol bomber. This development was predicated upon large Fleet actions—the type of action which culminated in the battle of Jutland. This type of action requires the use of ship-based and long range tender-based seaplanes capable of distant over-water operations. The seaplanes were designed primarily as scouts and secondarily as bombers. All air operations were co-ordinated to battle fleet actions. However, the present Naval war has not turned out that way. With a single exception it has consisted of actions fought by comparatively small task forces and of anti-submarine patrol work involving the lighter, more mobile units of the Navy. No really large fleet actions have been fought. The small actions have taken place in widely separated and comparatively unknown regions. We have learned geography the hard way. And we have had to employ landplanes from our own coasts and from the more permanently established of our overseas island bases—our aircraft carriers—to do the job most effectively.

We turned from being country doctors who cure all and do all with the instruments at hand, to a group of co-ordinated specialists, each one with equipment for an expert job. We have had to fashion our tools to fit the jobs created by this war.

The Navy now employs land based landplanes as well as seaplanes for its tasks. Today, the Army and Navy are working together harmoniously to do the job of licking our enemies. The necessary planes are being interchanged when required. The Navy is using some Army type bombers, and the Army is using some Navy type divebombers for co-ordinated teamwork.

The incident which started the present trend toward landplanes was the saga of Patrol Wing 10. This wing, with about 40 PBY seaplanes, was in the Philippines when the war broke out. The PBY's were the only planes the Navy had out there and so, of course, had to be used in jobs they were unfitted for. The story of their fighting retreat and the eventual arrival of two of the original 40 airplanes in Australia is a familiar one. It will be brought up from now on whenever men talk of aviation heroism and miracles.

These PBY's were up against Japanese land-based fighters and the wonder is that any arrived in Australia at all. Strange as it seems, personnel losses were light compared to airplane losses. However, the seaplanes earned the name "cold turkeys." It may in truth be said that colder turkeys never existed. These airplanes were used for scouting and even bombing missions with no support or protection whatever. They were the only tools at hand and they had to be used as

(*Continued on page* 297)

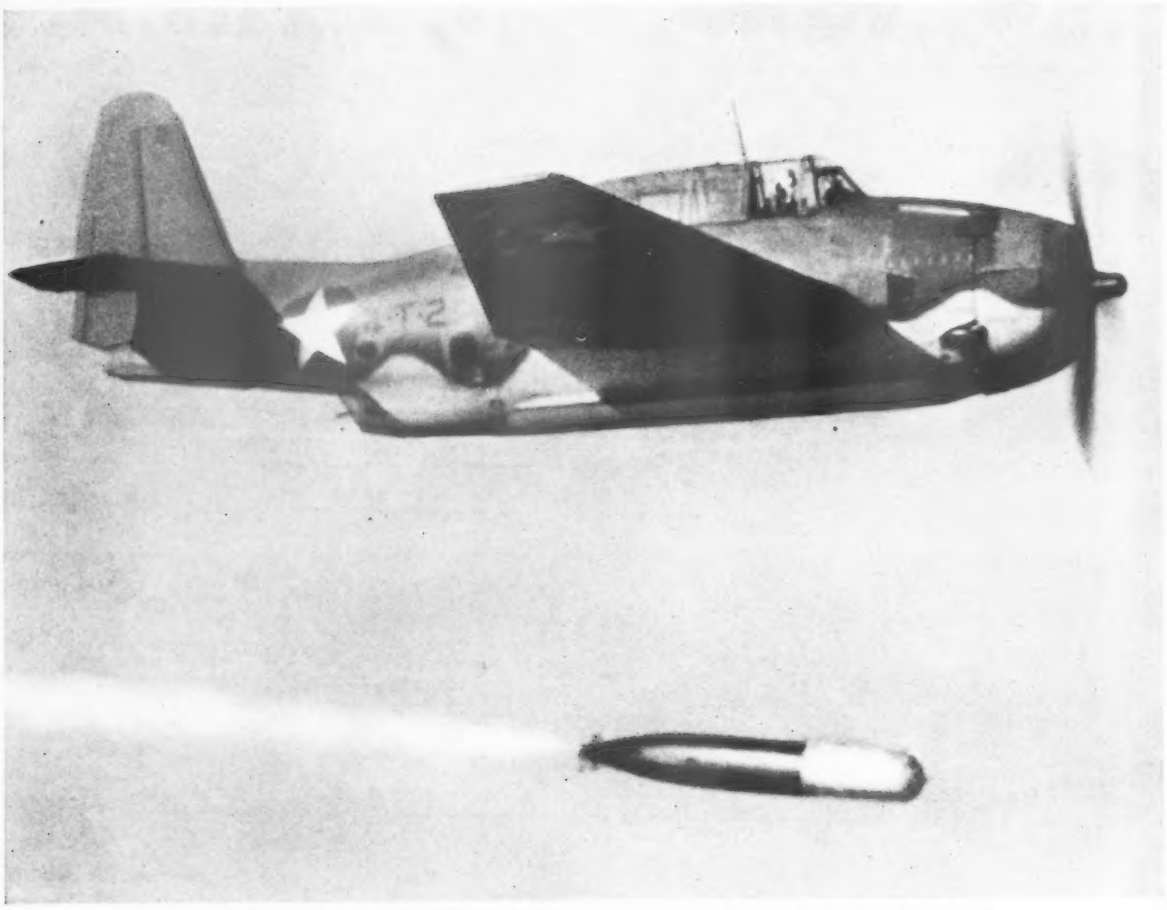
Sudden snow flurries add to flying handicaps in Alaskan and Aleutian areas. Here a PBY patrol bomber is tied down behind sandbag "pillbox." Weather conditions account for difficulty in maintaining sky patrol of northern area.

TORPEDO BOMBER

Scourge of the capital ship, this airplane is one of the most potent types ever developed by the U. S. Navy.

A Grumman "Avenger" taxies down the deck of a carrier.

TORPEDO BOMBER



Only torpedo bomber used in the Navy today is the Grumman "Avenger." Torpedoes weigh nearly a ton.

by Comm.
DONALD E. WILCOX

Following his graduation from the Naval Academy in 1923, Commander Wilcox saw a wide variety of duties before being ordered to the Bureau of Aeronautics in 1942. He has served on the "Nevada," "Jason," "Heron," "Lexington," "Detroit" and the "Wasp." He also held the post of assistant Naval attache for air at the American Embassy in London.

WHEN British aerial torpedoes sank the Italian ships at Taranto the torpedo plane came into sudden prominence. Since then, its devastating effect has been proved repeatedly—by our own and enemy pilots. In the destruction of the *Repulse* and the *Prince of Wales*, the Japanese grimly emphasized the power of this weapon to sink armored ships. In the Solomons, Coral Sea and other actions, U. S. Navy torpedo planes have played an even more vital part.

But this is only the beginning. In future attacks, our massed torpedo-attack flights may include 300 planes or more, if the size of the enemy surface force warrants it.

Many of the public, recalling the tragic fate of Torpedo Squadron 8 at Midway, may believe such operations little short of suicide. But the sacrifice attack at Midway was unique. The planes used were obsolescent. (These were TBD's, since removed from service and replaced by the faster, more maneuverable Grumman TBF.) The point of launching and their limited range kept them from climbing to the altitude necessary for the high-speed diving approach. Because of equally limited fuel supply, they could not hold back their attack for co-ordination with the dive-bombers. Also, and most important, no fighters were available for protection against carrier-based Zeros.

Fully aware of these tremendous odds, Torpedo Squadron 8 went gallantly into battle, doomed from the outset. But their

loss was not in vain. Following the torpedo plane action in the Coral Sea battle, the Japs at Midway concentrated all their fighters on the slow TBD's, leaving our dive-bombers almost unopposed in the air. Though Ensign Gay was the only pilot to live through that inferno, the Navy will never forget the heroic sacrifice of his comrades in Squadron 8.

The new TBF *Avenger*, by its high speed, is less vulnerable to enemy antiaircraft and machine gun fire during its approach. In the critical period, from 3,000 to 1,000 yards, the *Avenger's* speed enables the use of swift evasive tactics. Well-trained pilots can usually throw off enemy gunners. By the same high-speed maneuvering, after torpedoes are released, losses if any will be kept to a small ratio.

A new type of plane may emerge for such attacks. At present, carrier-based aircraft include fighters, torpedo planes and dive-bombers. The two latter functions may be combined, with a resulting torpedo plane capable of dive-bombing and also scouting. A large carrier could then operate with 30 torpedo-dive bombing planes and 50 fighters. With such a combination, one fighter could be sent to protect each bomber, leaving a unit of 20 fighters to defend the carrier.

The box-score for torpedo planes has fully vindicated the small group of Naval officers who have stubbornly fought for this type of plane. For years, they have faced the skeptical criticism of high-level (horizontal) bombing pilots as well as some non-flying officers.

Horizontal bombing against a stationary target, using the precise Norden bombsight, will get its fair share of hits. The ratio will depend upon opposition by enemy fighters and the amount of antiaircraft fire.

But high-level bombing against speedy and maneuverable surface craft usually proves futile. Practically all the large Japanese combat ships sunk or damaged to date have been hit by Naval dive-bombers or torpedo planes. Horizontal bombing has yet to knock out a major combatant vessel.

Some non-flying officers still maintain that torpedo planes can be driven off easily by antiaircraft fire. But the most determined AA gunners cannot cope with a full-scale torpedo plane attack, in which 18 planes approach at high speed from every point of the compass.

At the relatively close range of 1,200 yards, a speeding torpedo plane is a small and difficult target. Eighteen targets slanting down at high speed from all sides will confuse the most ardent exponents of AA fire. And the new, fast TBF is no sitting duck, as the Japs have already learned from sad experience.

Dive-bombing is a highly effective weapon. The U. S. Navy may well be proud of having originated this form of aerial attack. In World War II, dive-bombing has paid its way repeatedly. Well trained dive-bombing pilots can hit anything. They can sink lightly armored combatant ships. But it is questionable if they can do more than cripple a battleship.

Dive-bombing requires at least a moderate ceiling. Torpedo planes may be launched under low ceilings and in all but the heaviest weather; low ceilings and mist are even an advantage. In such weather, torpedo plane pilots may close in to point-blank range. This requires high skill in instrument flying, a point increasingly emphasized in training for such operations.

The torpedo's chief value is its ability to deliver a knockout punch—under water. Dreadnaughts can be armored above water so that damage from heavy bombing attacks will not necessarily be fatal. (The sinking of the *Bismarck*, after underwater damage by a torpedo plane, is a case in point.) There are many instances where lightly armed vessels have made port after intensive bombing. There is no known case of a ship making port after equally intensive torpedoing. Submarines, destroyers and cruisers can, of course, inflict the same underwater damage—if the situation is favorable. Because of their low speed and vulnerability, their chances for successful torpedo attack cannot compare with plane operations. For example, it is practically impossible to torpedo enemy ships in a protected harbor except by aircraft.

Unless surprise is a chief factor, torpedo attack against heavily armed warships by submarines or surface craft is not practicable. Without the surprise element, the range at release-point is so great that the enemy ship can dodge or outrun the "fish."

For the cost of one destroyer, 30 or more torpedo planes can be put into operation. The crews involved total only a fraction of the crew of a destroyer. Where the destroyer will attack at a speed of from 35 to 40 knots, a modern torpedo plane may dive in at a speed of 250 m.p.h. And while the destroyer attacks from one direction only, a massed plane attack will come from every direction.

Admittedly, submarines remain a menace at sea. But with more efficient sound gear, radio locators and better patrol aircraft the value of submarines is on the wane.

Submarine attacks are best made with full surprise. Under any other conditions a hit is largely pure luck. The victim zigged when she should have zagged. This is no deprecation of our undersea service. Our submarines are splendidly manned and operated. Under extreme difficulties, they have done their full share, covering shipping routes, combat areas, on long range patrols—and always in danger.

Where considerable surface ship activity is expected, a number of subs may be concentrated, with important success. After our capture of the airfield at Guadalcanal, the Japanese concentrated submarines near the island. This interference with supply lines is believed one of the chief reasons for delay in obtaining a complete success at Guadalcanal.

In this global war, submarine and surface torpedo attack will continue to take an important part. But the modern torpedo bomber, with its complete surprise and knockout punch, will soon become the acknowledged leader in all torpedo operations. In the final and conclusive action against the enemy surface fleet, the U. S. Navy torpedo plane squadrons are certain to play a leading role.

END

Much of the credit for the sinking of the Jap carrier "Ryukaku" in the Coral Sea was due the torpedo bomber. The Douglas "Devastator" (TBD) at the bottom of the picture has just launched its torpedo and turned away.

THE ENEMY

He's tough, brutal and fanatical—but U. S. Navy pilots already have tabbed nearly all of his serious shortcomings.

This is the typical Jap pilot: flag around head, gun and samurai sword. Emergency supplies from shot-down Jap plane (below) include concentrated foods, candy, whiskey.

BEFORE Pearl Harbor the American public had a fairly good picture of the average Japanese. He was a small, jaundice-colored man, bristling with teeth and wearing a pair of tortoise shell glasses. He was unctuously polite, grinned all the time, and had a rather irksome habit of hissing when he talked. Obviously, this does not add up to a very fearsome sort of person, and most Americans were inclined to smile tolerantly whenever our so-called alarmists sounded their storm warnings of the "yellow peril."

But the picture changes. The concept of the harmless little man has, belatedly, been shattered. The Japanese, once a prime favorite with humor-loving newspaper caricaturists, are beginning to shape up as one of the unfunniest races in history. This being largely a war of the air, it might be of interest to have a good look at the Jap airman, who is considered by many to be our No. 1 antagonist at the moment. What kind of a bird is he? American flyers returning from the Pacific war zones have found him, though in no sense a superman, anything but harmless. He is a highly trained fighter of remarkable stamina, considering his microscopic appearance—and, what is more dangerous, he has been fanatically indoctrinated with the spirit of killing. However, at the outset of the war he was actually an unknown quantity.

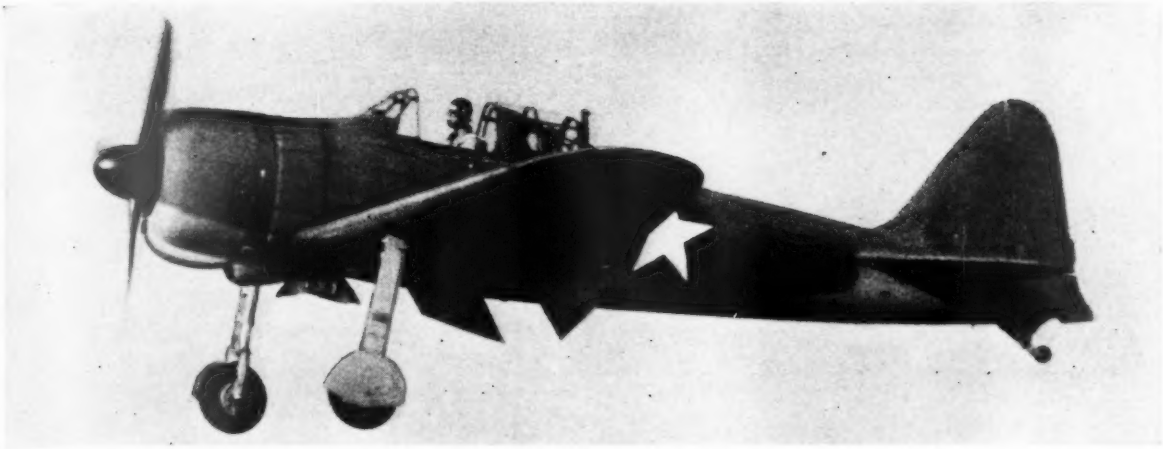
As one Navy flyer has said of his squadron's first sortie into battle, "We had no idea of the type of plane or pilot we were going to run into. We knew only this: that the Japanese were well disciplined in the air, flew a beautiful formation and that they would never give up an attack once they started in—even to the last plane. We knew that we would have to knock them down or else they would come on in." A good example of the Jap's doggedness in the early battles was a seaplane pilot who attempted, single-handed, to intercept several Navy dive bombers and torpedo planes. After jumping on everything in sight and doing considerable damage, the Jap made one final error of judgment. He knocked off gunning at the dive bombers and, somewhat overzealously, headed for the fighter plane of Lieut. Noel Gayler, who was heading his division into a strafing attack on an enemy cruiser. In the middle of a dive, Gayler spotted the seaplane and lifted his nose up just long enough to emit a blast from his machine guns. Then he kept on with his dive. The Jap went down.

Before going on to a study of the Jap airman it might be profitable to examine the following paragraphs, written by a British flyer for the British magazine "The Aeroplane," as general background material on the Japanese character:

"The Japanese are generous and hospitable, and there is nothing they will not do for those who serve them well. But in their business relations they are crafty and cunning, and though slow in thought have modelled themselves on German lines and are splendid organizers. Sympathy seems to be completely foreign to their nature, and civilization has not succeeded in stamping out of their characters a distinctly cruel vein, which is especially shown in their treatment of animals.

"I shall never forget a 'hare hunt' organized by the Japanese officers for our entertainment. We could not avoid attending what proved to be a thoroughly revolting spectacle.

"Nets were spread across certain corn and mulberry gardens —I call them gardens because they were not large enough to be dignified with the name of fields—and three tame hares were released. The Japanese officers and men, some hundreds



After crashing in Aleutians bog (below), this Zero was repaired and is being flown by U. S. test pilots. At least one new American fighter already has proved superior to Zero in all categories in mock air combat.

in all, spread out in a long line and walked forward, shouting and singing to frighten the three miserable hares into the nets, where the poor creatures were caught with no chance of escape.

"The largest was then tied by the legs upside down in a tree and left there to die, whilst one of the small ones was held aloft by an officer for all to see, kicking and struggling. It was then hurled again and again into the air and allowed to fall half stunned to the ground. This process of killing would have continued if a British officer had not asked them to stop.

"They are extremely industrious and curiosity is deeply rooted in every Japanese nature. Although they have little, if any, inventive ability they are wonderful copyists and consider that honesty is quite unnecessary in business.

"A certain British firm, for instance, placed a large order for a very good class of pencils. These were supplied, and to all outward appearance corresponded to the sample. It was found, however, that although the lead was of the same quality and the wood cases were identical, only a small piece of lead had been put in each end. Unfortunately, for the British, this was discovered too late.

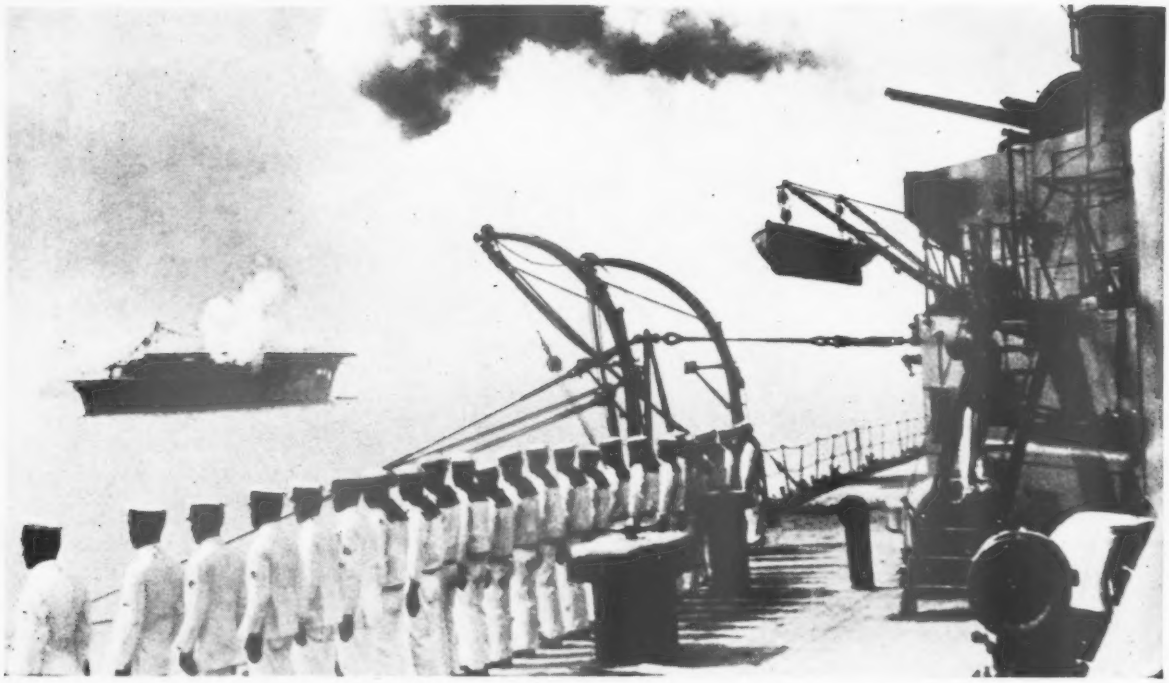
"The Japanese is a hardy little man and can put up with much hardship and discomfort. Age is very difficult to judge because the women age very quickly and though they are no longer-lived than Europeans their old people look very old—an illusion caused largely by their black hair."

The effectiveness of the Japanese as an air fighter is due more to thorough training than to any inborn combat ability. The forces that attacked Pearl Harbor and carried out the assaults in the Philippines, Guam, Wake, Midway, the Solomons and other islands of the Pacific, had been coached for those jobs for years. Each move was planned in advance; the broad strategy and individual tactics had been discussed over and over and examined for flaws. Yet, considering all this planning their successes were not staggering. At Pearl Harbor, due to the element of surprise, they were able to cause great damage without much opposition. But at Wake Island, for example, a handful of Marines stood them off with the infliction of considerable losses. The immense task force sent toward Midway met an opposition that must have come as a shock to the Japanese. American Army, Navy and Marine forces, gathering momentum like a Notre Dame backfield, moved in and hit the fleet from every angle and with such force that within a few hours it had lost upwards of 30 ships and was headed homeward in disastrous and humiliating rout. Our losses were comparatively slight.

In air combat the Japanese fighter is persistent and courageous but not imaginative. He sometimes stays in formation when it would serve his purpose better to pull out and fight independently. He is well equipped to meet any maneuvers that have come within the scope of his training, but in the face of new ones he occasionally acts bewildered. Also, in cases where a squadron leader is shot down, the other Japs in the formation act confused and almost invariably turn around and go home. This may be due to the fact that only the squadron leaders are told the details of a mission they are on.

One of the British officers who went to Japan in 1921, as a member of the British Air Mission which helped get Japan started as an air power, has given the following opinion of the Jap airman: "The Japanese as pilots I consider very good. They are steady and reliable and I think the average is high. They produce very few star turns, but they also have very few failures. Their great failing is that they are not quick enough in an emergency."

At the time of the battle of Midway, the Japanese Zero planes were in some ways superior to ours; they would outmaneuver and outclimb them and would fight at higher altitudes. Yet many Navy pilots flying the Grumman *Wildcat*, or



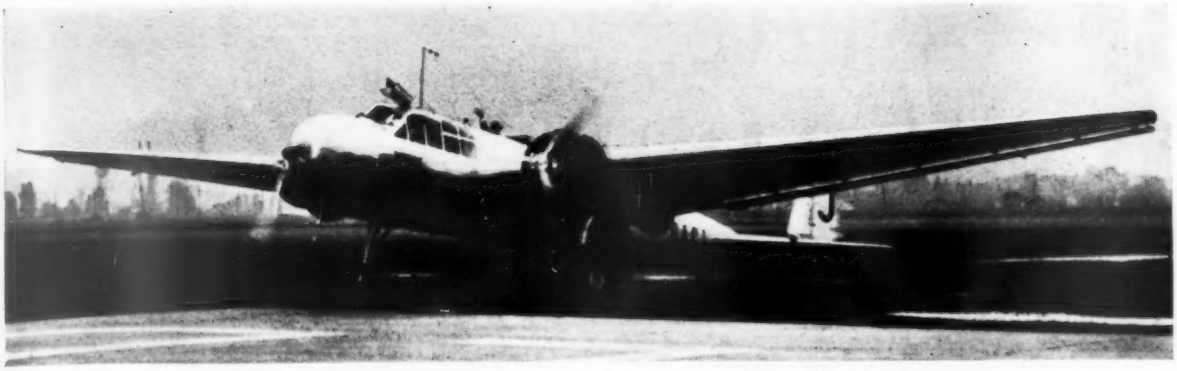
Passing the battleship "Mutsu" in review is Jap's big carrier "Kaga," sunk by Navy pilots at Midway on June 4.

F4F, consistently defeated them in dogfights and in all-around air combat. There are several reasons for this, a few having to do with the planes but the majority being concerned with the men themselves. The Grumman, more heavily armored, could take harder hammering before being put out of commission and it had better firepower and protected fuel tanks, reducing the possibility of its blowing up in midair or going down in flames. However, during those early engagements it was in the quality of our manpower that our noticeable superiority lay. Flyers like O'Hare, Thach, Gayler and McCuskey knocked down Jap planes like clay pigeons at a skeet shoot.

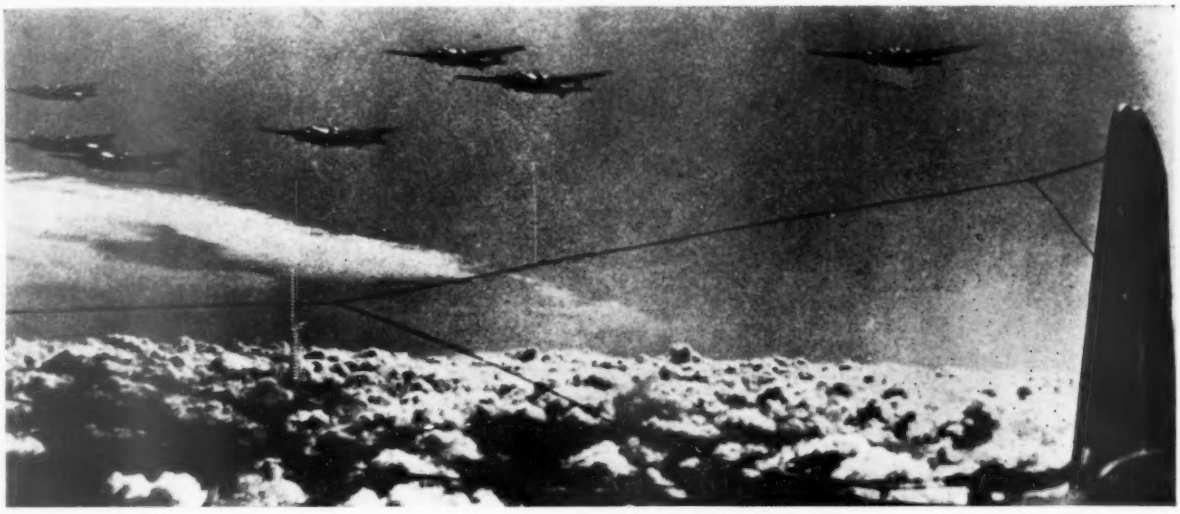
The answer is perhaps simple: the Japanese is a fellow of limited athletic ability. For years Japan was pre-occupied with the singular fetish of wanting to develop the best baseball team in the world. All the children in the country were provided with fungo bats and baseballs at the age of five or six and started on a rigorous program of conditioning. Virtually every time nine males of any age got together they formed a baseball team and began looking for nine other males. All of Japan was playing baseball like mad, and before long the citizenry got the notion that they could beat anybody in the world. It was at this point that they invited the Yankees over for a series of contests. The Japanese could hardly wait; they were looking forward eagerly to a rout. They were not mistaken. The Yankees laid into the scrawny Nipponese pitchers

(*Continued on page* 206)

When hit, Jap planes almost invariably explode and burn, as did this light bomber during Coral Sea battle.

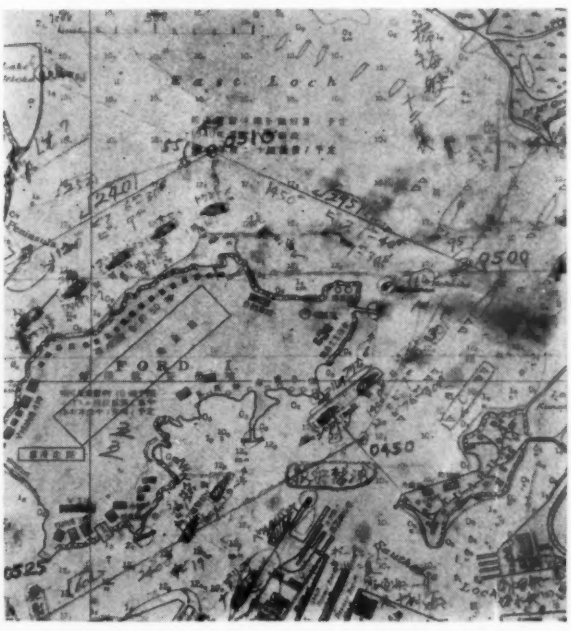


The widely used twin-engined Mitsubishi bombers below proved a familiar sight to Americans. First such airplane to appear in the United States was on a "good-will" flight to the U.S. from Tokyo. Prophetically enough, the Japan-U.S. flight was made via Siberia, the Aleutian Islands and Alaska.



Jap engines and propellers closely resemble U. S. types. American manufacturers sold many to Japs before the war.

This is a captured Jap chart of Pearl Harbor, with ideal targets for bombing pilots carefully identified and marked.



THE MARINES

by
MAJ. GEN.
RALPH J. MITCHELL

General Mitchell, director of Marine Aviation, graduated from the Naval Academy in 1915, and won his wings in 1921. He then served at Guam, San Diego, Quantico and other Marine air stations. In 1930, he was awarded the DFC for his activity in the 1930 Nicaraguan campaign against bandit forces. His flying orders have taken him to many scenes of action, including Guadalcanal.

BY their gallant, hopeless defense of Wake Island, the Marine Corps airmen of Fighting Squadron 211 have become immortal in the memory of America. In our continuing offensive against Japan, Marine aviators fighting at Midway and Guadalcanal have won an honored place beside the heroes of Wake.

Marine aviation has many "firsts" to its credit, but I like to think of that famous "first" at Wake, when two fighter pilots dive bombed and sank a Jap cruiser. In battered Grumman fighters, Captains Elrod and Tharin plunged down almost to strafing levels. Before startled enemy gunners realized their purpose, the improvised dive bombers had struck their death blows, leaving the ship aflame and sinking.

In that "unorthodox" attack, the Japs had the first of many rude shocks administered by Marine pilots. No report of fanatical Jap "suicide" attacks has yet matched the quiet courage of Lieut. David Kliewer, who dive bombed an enemy sub and sank it. In a patched-up fighter, Kliewer flew down under furious aerial attack to accomplish his mission, adding another name to the honor roll of Marine Corps aviation.

At Midway, against heavy odds, Marine pilots brought new luster to the emblem of the globe, eagle and anchor. Some of them lost their lives—but the manner of their going will not be forgotten. There was Major Henderson, who dived to 400 feet to bomb a Jap carrier, too low for a chance to pull out. There was Captain Fleming, who gave his life the same way. Before the Japs were turned back, still others had made the supreme sacrifice.

Then came Guadalcanal. Out of that inferno of the South Pacific have come the Marine aces—Capt. Robert Foss, with 22 Japs to his credit; Maj. John Smith, with 19; Capt. Marion Carl, with 16; Lieut. Col. Richard Mangrum, of dive bombing fame, and many others imbued with the same fighting spirit. Under constant attack, by land, sea and air, the Marine pilots at Guadalcanal have fought on, taking a five-to-one toll of enemy planes.

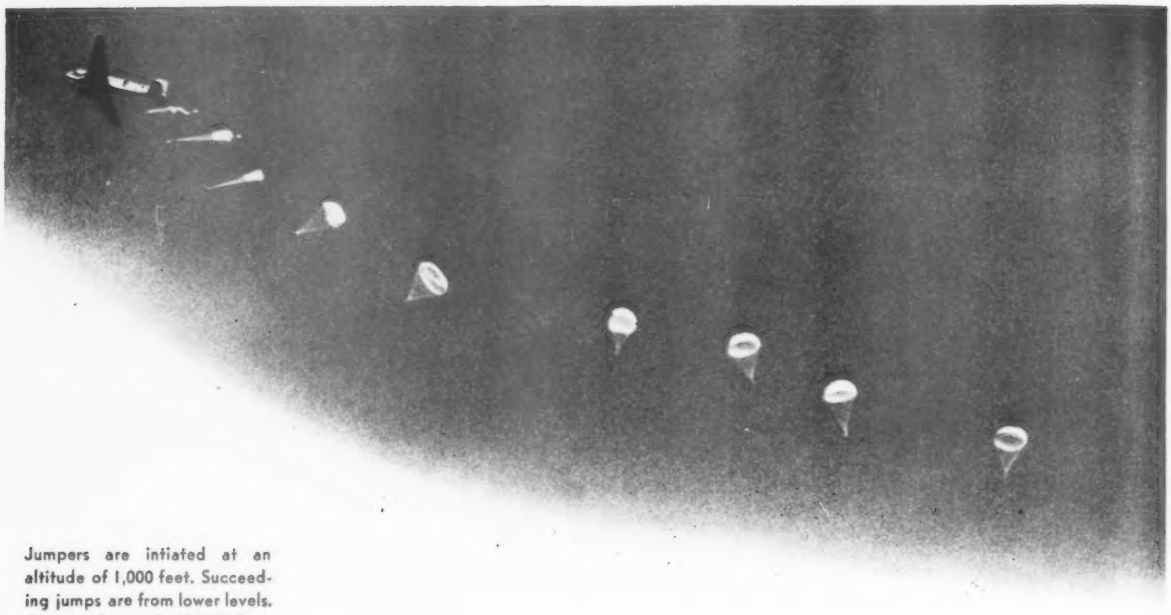
All this—magnificent as it has been—is only the beginning. There are grim battles ahead. But of one thing America may be certain. The Marines will go on fighting—whether they wear the gold wings of pilots, or dungarees of ground crews who keep them flying.

PARATROOPS

Tough fighters among some of the world's toughest are U. S. Marine paratroopers. They plan several unfriendly visits around the world.

Marine paratroops board a Douglas R4D transport.

PARATROOPS



Jumpers are initiated at an altitude of 1,000 feet. Succeeding jumps are from lower levels. Average for combat is 300 feet.

by Lieut. Col.
LOUIS E. MARIE

Upon his graduation from the Naval Academy in 1920, Lieutenant Colonel Marie was assigned, at his request, to the Marine Corps. He has seen service in China, France, the Philippines and at many posts in the United States. From 1936 to 1938, he was a student at the French Superior School of War. A native of Philadelphia, Pa., he now is on duty at Marine headquarters.

A SUDDEN, increasing roar of planes, the crashing of bombs, the screaming crescendo of dive bombers—a brief lull—and the sky is suddenly filled with white and vari-colored swiftly-dropping canopies of silk—*paratroops!*

Let's take a look back over the comparatively short history of this newest branch of the world's military forces, and not "jump to a conclusion" like the parachutist whose rip-cord wouldn't work.

The first we hear of parachutes (except as a means of escape from falling airplanes, or a thrill for spectators at country fairs) is in Russia in 1935 and 1936, during military maneuvers when armed troops were dropped in certain strategic points, the results apparently being quite satisfactory to the Russians.

The writer was in Europe about the time of the 1936 Russian maneuvers and, on asking a few of the military minds of a certain nation what they thought of parachute troops, he was given the impression that the "thought" was very small. A couple of years later though, while watching a parade one day in 1938, in that same country, the writer was quite interested to see a fairly large organization of parachute troops, completely equipped, pass by in aviation trucks. Evidently that slightly disparaging "thought" had undergone a rather substantial change.

The Germans, of course, with their usual efficiency and thoroughness took hold of the Russian idea and developed it to their own use. In fact, if their secretiveness was working normally, the Germans had probably been experimenting with parachute troops as long as or longer than the Russians. The first decisive large scale use of paratroops in combat was made by Germany in the ruthless flattening of Holland in 1940.

The Italian army—well, let's brush them lightly off by saying that nothing has been heard of any actual use of Italian paratroops—in combat.

For several years our own forces have been experimenting with equipment, organization, and employment of paratroops. In 1940, the Marines, in order to increase still further their effectiveness as the Navy's "spearhead," organized and started training specially selected men and officers for parachute battalions. Everybody knows what Marines are like when they buck into opposition, but when you add to that the general characteristics and ability of a paratrooper—there you have a piece of the war machine that's something to watch—from the right side of the line!

Just what are these paratroopers that we hear about, see not much of, and know still less about—except that they are bad news in anybody's fight? What are their physical requirements, what kind of training must they undergo, and what is their ultimate mission? Some of this information can be given out, but a lot of it (and the part we won't talk about here) must be kept well under cover for reasons we all realize.

The idea that a paratrooper is a superman, or "a man from Mars," as some colorful publications describe him, should be erased. He is the same as any other man except that he is picked for a special type of job. They (the paratroopers) must all be of an average size and weight, as a small, light man, taking longer to drop, will be carried too far from the remainder of his unit. A "Para-Marine," before being taken

Each man hooks parachute rip cord to cable. As he falls free from open door his 'chute is thus automatically pulled open.

Men leave plane speedily, 10 jumping within 12 seconds. Note boots of one man as another falls out and a third moves up.

Although men carry emergency chest 'chute, automatic pull (seen below in action) rarely fails to operate properly.

Paratroopers are equipped for action when they land. Among equipment carried with them during descent can be noted hand grenades, machine gun belts, bayonets and even an ordinary baseball bat.

into a parachute unit, must have received the same general training as other Marines. He must be between 21 and 32 years of age and weigh between 135 and 190 pounds. He must have a strong heart, and unusually strong bones and joints (toughened by later training), to withstand the jolt of landing, which is about equal to jumping from a 12-foot platform.

Speaking of jolts brings to mind the story of the new paratrooper who had completed his preliminary training and was up for his first jump from a plane. The sergeant with him said he had nothing to worry about, that when he jumped his main 'chute would let him down easy, but if by any chance that failed to open, to pull the rip-cord on his auxiliary 'chute and he'd still come down all right. Also that trucks or ambulances would be waiting so that none of the jumpers would have to hike back to camp. The new man, satisfied, stepped off into the blue, then discovered that his main 'chute had failed to open. Remembering what he had been told, he gave a yank, then several more, on the auxiliary 'chute, and that failed to open. Still remembering what he had been told, he looked down toward the ground, cussed, and said, "I'll bet they forgot to send out that damned truck, too!"

The training these men undergo looks comparatively simple in print—but just try it once! Briefly, this is what happens:

During the first part of the six weeks' course, the men are taught to pack their own 'chutes. They study landing methods. Daily conditioning exercises strengthen their legs, back and abdominal muscles to withstand the shock of landing.

Actual manipulation of the parachute is practiced in 250-foot jumps from huge steel towers. The Para-Marines are then taken aloft in planes and descend from an altitude of 1,000 feet. As this training progresses, the transport carriers fly at lower and lower altitudes, until the troops are bailing out only 300 feet above the ground.

Speed is essential. In battle training, a single plane will disgorge troops at the rate of 10 in five seconds. This assures that entire combat units will land in a small area and lose no time in forming their lines. While descending, the men are able to "steer" their 'chutes still closer together for landing.

Steering is also employed to avoid landing in water, or other dangerous spots. It is accomplished by pulling in the lift web or lines of the parachute canopy, thus making the exposed area smaller and causing a faster fall. This is called "slipping" a 'chute. If a trooper sees trees below him he can sail over them by manipulating the lift webs so as to ride along with the wind.

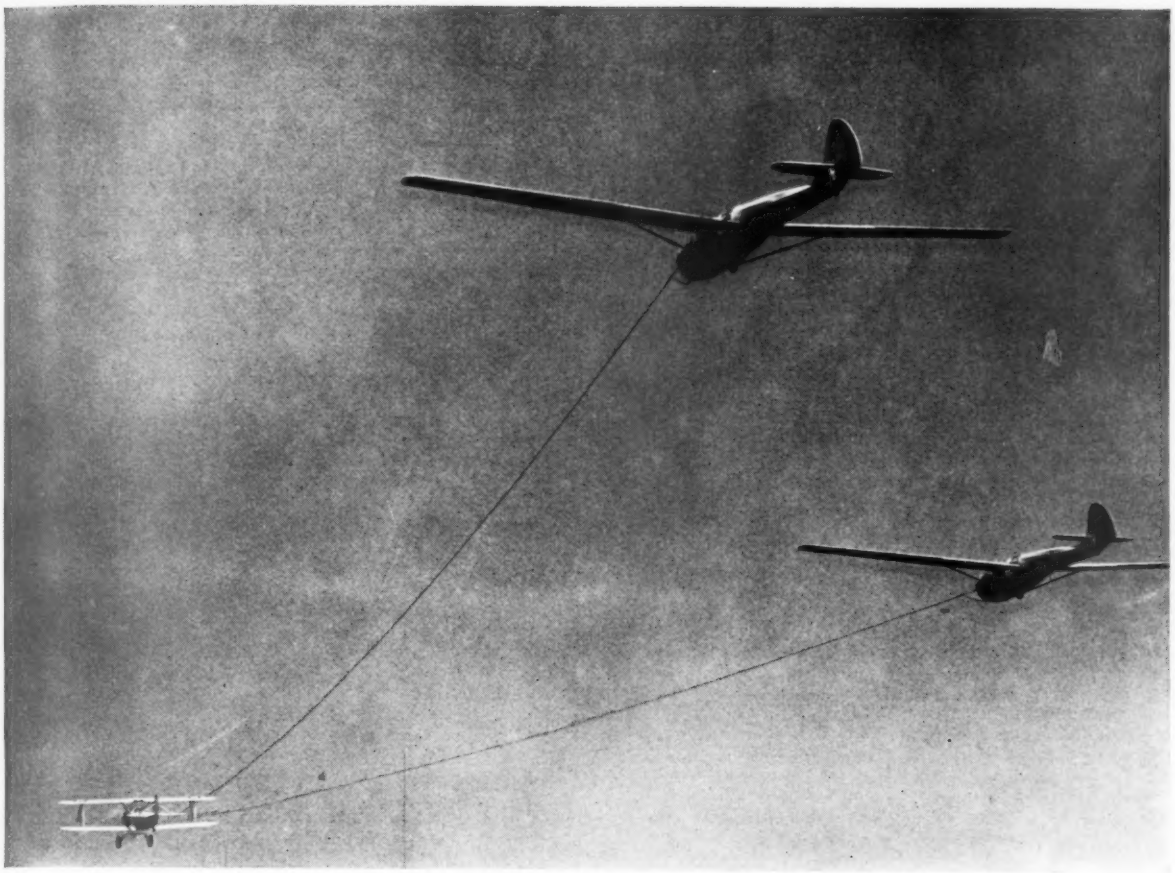
The uniform of a Para-Marine is a practical, many-purpose ensemble. The chief article is a heavy cloth jumper with tremendous pockets. The loose fitting trousers tuck into leather boots. Marines wear three pieces of headgear when jumping. A leather helmet that looks like an aviator's headpiece fits closely over the head. Over this goes a plastic helmet. Finally, a steel helmet fits over all and covers the back of head, the sides of the face and the forehead.

The morale of Marine Corps parachute troops is remarkable. They anticipate with eagerness the day when they come down in great clouds from hundreds of transport planes, landing behind enemy lines to destroy or capture ammunition dumps, airports, railheads and highway junctions.

They know they will be plummeted by the most direct route into the thick of the fighting. That's why they volunteered and why others are joining them day after day in endless numbers.

Even before being dropped into the middle of somebody's particular little hell, there are incidents that make life interesting for the paratrooper. Take for instance the actual case of a certain Marine officer who was an old hand at the game. He had stepped off and everything was going nicely, except that he was coming down over a pine forest area beside the landing field. He started "slipping" his 'chute so as to get clear of the trees. This he managed to do, his heels just brushing the tops of the last trees. But troubles never come singly. He looked up to see dead ahead of him and in direct line of flight, an iron light post marking the corner of the landing field.

(*Continued on page* 294)



Multiple towing, an air show spectacle in this country years ago, has become an active phase of aerial invasion.

GLIDERS

The Navy, through its Marine Corps glider training program, will take advantage of any military possibilities in towed craft.

by Lieut. Col.
JOHN WEHLE

Commissioned on January 25, 1930, Lieutenant Colonel Wehle was ordered to aviation training on March 3, 1932. He has done experimental and test work at the Naval Aircraft Factory; has served on the "Langley," "Saratoga," "Ranger" and the "Lexington," and at the American Embassy in London. He now is in charge of the glider training program of the Marine Corps.

IN the history of war, the introduction of a new fighting weapon used boldly is usually attended with success. This is as true of the glider as it has been of every other new weapon. Strangely enough, the glider, whose potentialities as a military weapon were not discovered or realized until revealed by the Germans over a year ago, antedated the airplane in this country. The glider duration record of 9¾ minutes was established by Orville Wright in 1911. This record remained unbeaten until 1921, when it was bettered by a German pilot, Klemperer, who flew for 13½ minutes in Germany.

It is more or less common knowledge that gliders were used by the Germans in their airborne operations against Crete. While the airborne phase of this successful invasion received a great deal of publicity, the Germans were also first to use gliders on several other, less-publicized occasions in Belgium, possibly during the occupation of Norway and in Libya.

Of all military weapons, there is probably none which is surrounded by so much misunderstanding as the military glider. The general impression exists that by using a glider one obtains something for nothing. Very few of us know what a military glider is or what it can do. The sporting or training glider is familiar to many of us. Few have ever seen a military glider. There is no similarity between the two and the general confusion that exists in the popular mind is a direct result of trying to think of military gliders in terms of sporting gliders.

It would perhaps serve our purpose best if we defined a military glider. A military glider is a military airplane without engines, designed for a special purpose and designed to be

towed by a powered aircraft. It should always be remembered that a military glider is nothing by itself. There must always be a powered aircraft to tow it. It does not soar and it should be capable of a high rate of descent. The question that may be rightly asked at this time is, why can't a powered aircraft do a glider's work? There is only one answer. It can. What is more, it can do it more efficiently. That is to say it would be more efficient to put the load in a powered aircraft than to put the load in powered aircraft and glider combination.

It follows, then, that if the powered aircraft is capable of doing the same work as the glider, why have the glider? The answer lies in the fact that while operational bombers and patrol planes are not designed to be efficient troop carriers or transporters of bulky objects, their power facilities can be used to tow a glider which can carry either troops, bulky equipment, or a tank. If these gliders are made of non-critical materials such as wood, and the facilities of the war-burdened aircraft industry are not employed, it is possible to obtain at some sacrifice of efficiency an auxiliary air transport service. This, in conjunction with the combat air force, can be used to transport troops and all their equipment at high speed over enemy controlled territory and to land these troops and all their equipment wherever they are required, behind the enemy lines if necessary.

This is an auxiliary air transport service and should be considered only as such. It will always be more efficient to carry troops and their equipment in a transport plane. It will always be more efficient to carry tanks and other bulky equipment in powered aircraft if you have a powered aircraft designed for the purpose. It will be possible to land these troops and equipment in the short space required by the glider if the airplane lands with the wheels retracted. These troops and their equipment could be transported farther and under poorer weather conditions, of course, in a powered aircraft, because of the limitations of the glider-airplane combination.

The chief limitation of the glider-airplane combination is that it cannot at present fly under so-called instrument conditions and, until this problem is solved, the range of the glider-airplane combination will necessarily be confined to areas of good weather. Whether this particular limitation or others influenced the Germans in the tactical use of the military glider is not known. It might be well to review briefly how they have used this weapon, since they are the only ones who have used it in this war.

In the taking of the Belgian Fort Eben Emael, some few gliders of small capacity landed on the fort. A Belgian officer who was captured in the fort states: "Just before dawn, on May 10, 1940, 10 to 15 German engineers landed in gliders on the fort. These succeeded in destroying a number of small cupolas and machine gun positions with special explosive charges. They also disorganized the antiaircraft defenses of the fort, which, in any case, were not properly effective owing to incomplete mobilization and treachery. The fort then was subjected to a prolonged dive bombing attack in which the bombing was remarkably accurate. Smoke signals made by the engineers may have assisted this attack. During the bombardment, one of the casements was demolished and through the confusion which resulted parachutists outside the fort forced an entry and captured the fort itself." The distances these gliders were required to travel to reach their objective was short.

During the occupation of Norway, some gliders were employed in transporting troops. The information on this operation is meager. Indications are that the number employed was small and the distances over which they were employed were also small.

In Libya, German gliders of 23-man capacity, were captured on the landing field at Derna. These were few in number and were used as far as is known to carry supplies to Rommel's forces in Africa. The distances from other Axis-held air fields were short and the quantity of gliders used small.

The vertical envelopment of Crete provided the first known operation in which military gliders used as a weapon in some force could be evaluated. The distances over which they were towed were small and, contrary to the general impression, the gliders were small, of 10-man capacity. They were towed singly, and they were used only in groups of 50 to 75, carrying from 500 to 750 troops. Tactically, they preceded the parachute troops with the mission of neutralizing certain antiaircraft positions located near the airfield. In this operation, approximately two-thirds of the gliders were successfully landed, while intensive dive bombing continued to hold down the defenders. They were the nucleus of the troops who later captured the island. The other third were not so successful and were wiped out. The remainder of the troops, some 30,000 in number, were landed by parachute and transport aircraft.

A glider pilot participating in this operation wrote in his diary:

"17th. I am to fly in the 3rd Squadron (staffel), third flight (kette) at the left of the flight. The objective is the island of Crete. At 2,000 hours General Student came and enquired personally of each glider (*Continued on page* 283)

One of Navy's trainers. Contrary to general thought, there is little similarity between the training and military gliders.

Side by side dual control is used in the Marine Corps' training program. Gliders can be built of non-critical materials.

BARRAGE BALLOONS

The ponderous, lumbering gas bag has been made an effective guard against low-flying enemy aircraft.

Cables suspended from barrage balloons create a steel web for the entrapment of unwary Axis pilots.

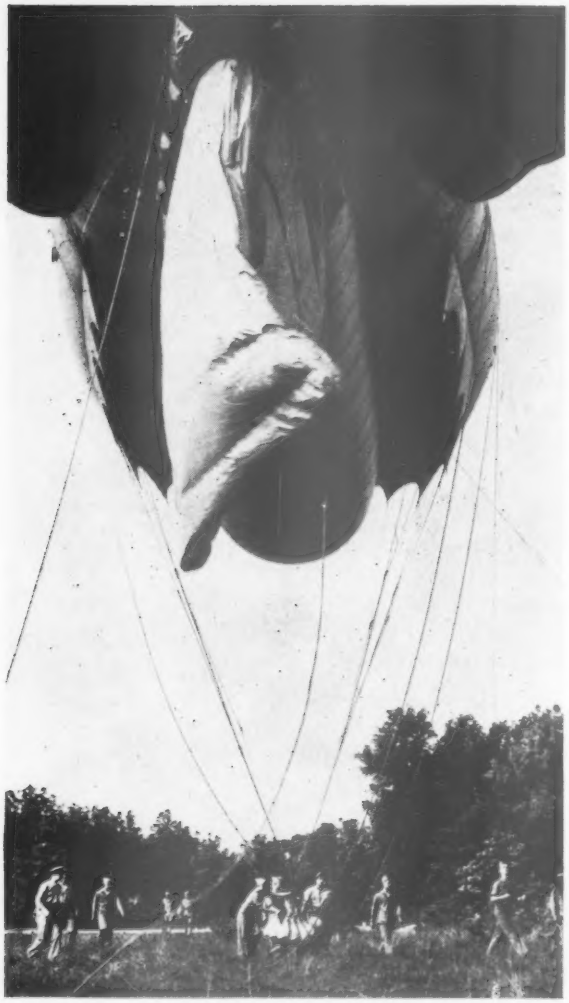
by Lieut. Col.
BERNARD L. SMITH

Lieutenant Colonel Smith, in charge of development and training of barrage balloon personnel at New River, N. C., is a veteran Marine aviator whose flight service dates back to 1912. Born in Richmond, Va., June 19, 1886, he was appointed a second lieutenant in 1909. In 1912, he went to the Naval Academy for duty in connection with aviation and has since been allied with flying.

THE first damage done by a Marine barrage balloon squadron broke up a large and thriving buzzard family. The first squadron to be placed in the field aided in the defense of an area where buzzards soar in flocks, diving and gliding continually during the day. The head of one large family made a practice of gliding in through the barrage to his abode, apparently unaware of the cables in the area. One evening, returning from a foraging trip, the buzzard started his spiraling glide just as the winch operators were looking skyward, preparatory to bringing in the balloons for topping off. At about 800 feet he ceased to spiral, put his nose down, spread his wings to their full six feet, and started a short, steep glide. All went well until his port wing encountered one of the cables, crumpling the wing instantaneously. He fell off into a fast spin and crashed to the earth about 50 feet from the winch. On inspecting the wreck it was found that the cable had snapped his main wing-bone completely. The accident was an indication of what barrage balloons were to do to airplanes a little later on.

The British first learned the importance of barrage balloons when they used them as a defense against the hordes of German aircraft which worked over England in the early stages of the war. Their balloon effectiveness proved under these conditions, the Marines decided that they might also prove effective for *offensive* work—first nature with the corps. The next step was the formation of a school, of which I was placed in command, to train sufficient officers and men for the formation of squadrons.

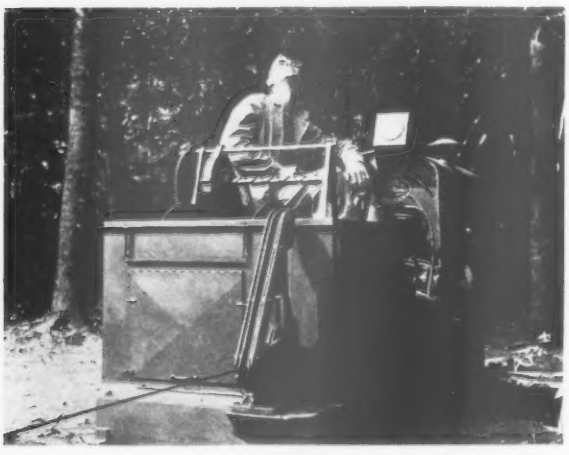
The fat, gray gas bags brought much comment when they first flew at Parris Island. A great deal of the comment, by its nature unprintable, came from the aviation units stationed at Page Field. It was understandable, however, and even appreciated, for it brought a glow of satisfaction to balloon men to think about the foreign-tongue grumbling that would be heard when the enemy later encountered complete squadrons.



The big tail fin spills its air as it comes to mooring. Note bottom fin has hole for air to rush in. When current ceases as bag nears the ground, the sack collapses.

★ ★ ★

The Marine on winch duty watches the slowly swaying balloon, alert to any sudden gust of wind. This cable winch controls movement of bag after it leaves hands of crew.



The first fence was probably built by some forward-looking cave man who found that enough stakes driven into the ground at the right places kept slinking animals away from his food cache. As the years passed, the fence developed, always with the same purpose: to keep the lower forms of life away from something the higher forms desired to protect.

Today the most technical and highly developed form of fence is still being used to keep out the lower forms of life. This fence, however, is no longer a purely defensive instrument. Barrage balloons, supporting tough steel cables, are now being used by the Marine Corps as a part of strong, offensive combat units. The protective cables, held many thousands of feet in the air by the balloons, are effectively preventing enemy aircraft from carrying out dive bombing, and keeping such aircraft at altitudes still not too high to be easily reached by the antiaircraft guns.

A good many of the first observers didn't understand how the balloons worked. Daily came the question, "Where does the man ride?" Quite naturally, in the process of training, a balloon or two managed to escape—they can become a bouncing terror in a high wind—and the stories regarding lost balloons went far and wide. One day the newspapers in a town miles away carried the story of a very ominous looking foreign "dirigible" which was sighted at sea. Later reports had the ominous dirigible landing and possibly disembarking enemy troops. At the school they just smiled, then went to recover their lost balloon.

When the Marines flew their first few balloons, it was gratifying to watch the commercial and military aircraft giving the area a wide berth. Regulations required that the word be passed when balloons were to be flown—to give ample warning to aircraft in the vicinity. It was also gratifying to hear of the berth given the area by our own pilots, who appeared to have great respect for the bags.

The first balloon flown by the Marines at Parris Island soon earned the title of "Swampy." And in that title lies a story of faithfulness, utter devotion and such outright cussedness as has never since been demonstrated by a barrage balloon in this or any other country. "Swampy" came to the school a strictly sea-level gas bag. She had never had her feet off the deck and apparently would have none of the higher reaches. After a rather abnormal struggle however, "Swampy" was finally coaxed into the air with the aid of helium and a determined crew. Aloft, she softly swayed to the breezes, while those who had been instrumental in getting her aloft just swayed. Not for long, however, because "Swampy" began to feel her oats as the altitude took effect under the influence of those varied and unpredictable Parris Island breezes. "Swampy" decided that the balloon box was the place for her. Perhaps she was lonesome, perhaps she was attacked by some strange creature of the upper reaches, but in any case she headed for the ground. Her first return-to-earth contact was violent and something of a spectacle. Under some strange power, she plopped her shiny round nose into the dirt, decided that perhaps it was better aloft after all, and headed back upstairs like a bee-stung squirrel. This action was too much for the already overtaxed cable—it screamed violently for assistance, then parted. "Swampy" was on her own at last.

It was somewhat later that the reports of the strange "dirigible" floated in, and it became known that "Swampy" had repented and was ready to return to the fold. Altitude and lonely nights had taken their toll, however, so the balloon, deflated in spirit, and more important, in gas, couldn't quite make it. Gently she returned to the bosom of the earth, in what must be one of the swampiest areas in the world. Tired and battered, she fell exhausted, as the newspaper said, to "possibly disembark enemy troops." Recovering "Swampy" took two days of hard work in waist-deep muck—hence, the title. (Later she attempted another lone voyage to the stratosphere, was again recovered, tore herself up on the ground, and now reposes, weary but intact, in the shop.)

During the early stages of the schooling there was a general feeling that to become a winch operator was about the most nearly perfect balloon job possible. This was because the winchman occupies a seat, even though it may be somewhat precarious. Too, this was before experience had taught several rather humorous if not horrifying lessons. At a *very* early stage in the training, one lad found himself, after much work, in the envi-

able position of winch-operator. He carefully paid out the cable, allowing the balloon to rise into a gusty sky. As the afternoon wore on, the gusty condition grew worse until it finally became necessary to bring in the balloon. As the winch operator prepared to bring in the cable, he noticed the ground below moving very slowly by. Slightly confused, he stared and as he stared the winch picked up speed until it was traveling over the ground at a lively clip. The operator's facial expression (prior to his sudden departure from the winch) was something to behold. After he left the seat, the balloon was attacked by another gust and in one violent heave it picked up the 4,500-pound winch and set it very ignominiously on its back. Shortly afterwards, the winch operator became one of the best motor vehicle mechanics in the organization.

Each squadron contains sections for balloon and winch maintenance, fabric and cordage work and the numerous other tasks which are a part of balloon handling. One of the most important parts of the squadron organization is the gas section whose sole job is the production and handling of the very necessary gas. This type of work requires a high degree of accuracy and an equally high degree of caution. Hydrogen gas is a dangerous element and if allowed to run free, can be ignited by the slightest spark. Hat ornaments are not worn for fear of contact sparks, and grounding is a by-law. Even properly grounded balloons have blown up in mid-air from static charges built up in amazingly short times. This is an ever-present problem of the barrage balloon men.

The fabric-working section also has its troubles, caused by the fact that the most important part of their equipment is a sewing machine. Where old-time Marines once broke out their needles and thread and made the necessary repairs on clothing, in the barrage balloon squadrons it now is a practice to take your torn or alterable articles to the fabric section. There is no charge and the only benefit gained by the sewing-machine operator is the experience which will probably qualify him for the tailor trade when the war ends and times once again become normal.

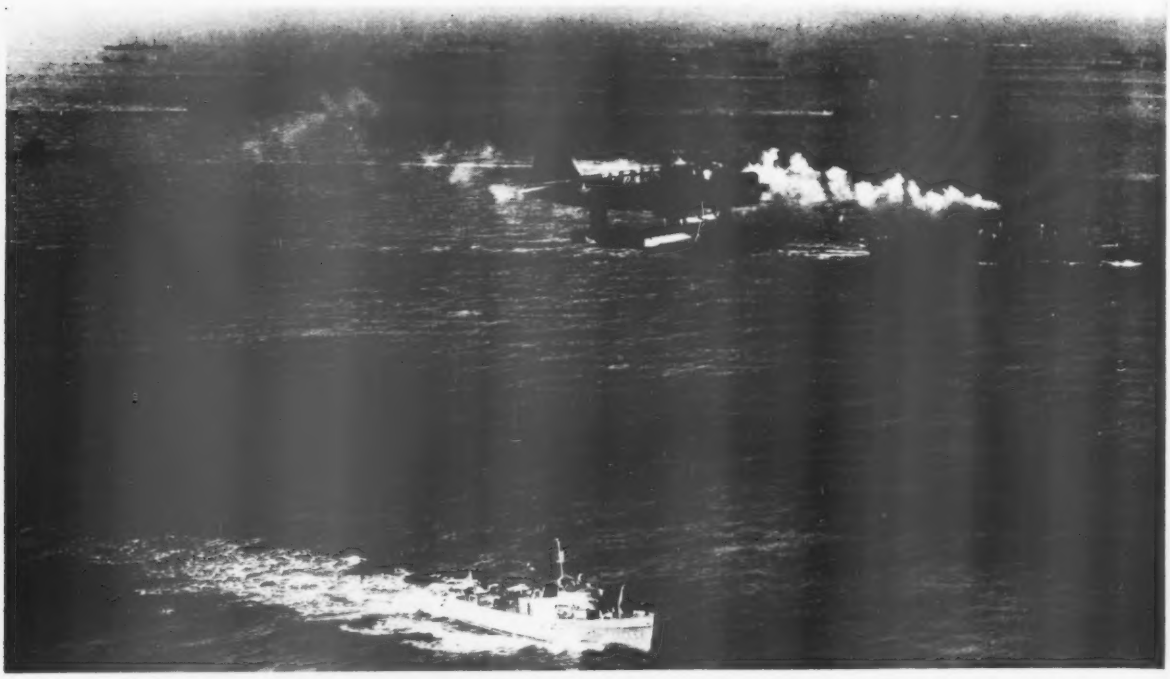
The aerology section of the barrage balloon squadron is the father-adviser where actual flying of the balloons is concerned. The aerologists' word is final during normal operations. Their job never ends; day and night the all-important pilot balloons rise into the sky, tracked by the theodolite. At night the pilot balloons must be equipped with some form of light to make them visible, a light that once caused a furor which will go down in history.

The particular balloon involved in this story was released from the very heart of one of the world's best-defended zones, an area where even the seagull's won't fly at night. As occasionally happens, there had been no word passed concerning the release of lighted pilot balloons by the newly arrived barrage balloon squadron. According to schedule, then, the aerology section of the squadron released its lighted balloon, which quietly started its skyward trip. For the first 1,500 feet of the ascent, the trip was uneventful, then all hell broke loose. Antiaircraft guns roared into action and the searchlight fingers prodded the sky. Alarms were sounded and intelligence wires hummed with the report of unidentified aircraft. The light in the pilot balloon finally disappeared, and aerology reports, slightly confused, were turned over to operations. Whether the light was shot out or worn out by the confusion has never been determined.

There are two general types of balloons being used today by the Marines. One is a completely gas-filled bag depending on internal rigging for its shape maintenance. The other is a part gas, part air-filled balloon known as the ballonet type. This type of balloon has a large windscoop in its belly which keeps the ballonet inflated and the gas section consequently at a more or less stable pressure. At Parris Island, where training of Marine squadrons began, the mosquitoes present a very irritat-

(*Continued on page* 298)

Balloon ground crews are trained to guard against the vagaries of their unwieldy charges. Sudden gusts of wind sometimes tear balloons from ground "anchors" and start them on uncontrolled flights.



A Coast Guard plane (OS2U-3) patrols vicinity of huge convoy for signs of submarines. Boat beneath is CG "sub buster."

The COAST GUARD

True to its motto, "Semper Paratus," Coast Guard aviation is maintaining its tradition of life-saving in the midst of doing an outstanding wartime job as an integral part of the United States Navy.

A GROUP of 21 seamen were huddled on the blackened hulk of a Norwegian steamer that was drifting in the Gulf of Mexico one mid-July day in 1942. Their plight was as acute as their misery. Survivors of a torpedoing, all the men had been severely burned and one of them had a broken back.

Just when it must have seemed that death would be preferable to any prolongation of their sufferings, a cheering sound reached the ears of the tortured men—the roar of a twin-engined patrol plane. It was the Coast Guard, keeping alive its tradition of life-saving in the midst of performing outstanding wartime service as an integral part of the United States Navy.

Although their plane had been designed for no such burden, Lieut. D. O. Reed, his co-pilot, Ens. V. C. Tully and the crew, put the big ship down on the water and took all 21 seamen off the wreck. Determination, superb skill and an encompassing desire to "get the job done" brought the plucky bunch to shore.

With the war just 14 months old, the log books of Coast Guard aviators are replete with exciting, often heroic, exploits which demonstrate the ever-increasing value of this little known branch of our Naval service. Five weeks before Pearl Harbor, President Roosevelt placed the Coast Guard under the jurisdiction of the Navy, a step which greatly increased the demands upon Coast Guard aviation. No longer were patrol, "flying ambulance" jobs and other rescue flights its primary concern. Now there was an enemy to stalk, grim fighting to be done. But, true to the slogan of the service, "Semper Paratus," CGA was ready.

Still small numerically, the service has come a long way since its inception in the summer of 1915, at Hampton Roads, Va., as a result of the pioneering spirit of the late Capt. B. M. Chiswell, who then was stationed there in command of the Coast Guard cutter *Onondaga*.

CGA sprang directly from Captain's Chiswell's idea for using planes in the search for the many old and poorly maintained schooners that frequented the Atlantic seaboard in those days. He had two enthusiastic adherents to his cause in then Third Lieut. Elmer F. Stone (commander when he died in 1936) and Second Lieut. Norman B. Hall, now captain in charge of the Port Security Section of the Coast Guard. These men presented their project to "Captain" Baldwin, who was well known in the early days of free ballooning and was then in charge of Curtiss Field. He lent them a plane and the results were so successful that orders were obtained for Stone to be assigned to Pensacola to learn to fly and Hall to go to the Curtiss Aeroplane and Motor Company at Hammondsport, N. Y., where he began the study of aviation engines. The vast potentialities of Coast Guard aviation were fast becoming actualities. One year later, on August 29, 1916, the Naval Appropriation Act authorizing the Coast Guard

An OS2U-3 being towed down the ramp for launching. A depth bomb beneath wing indicates anti-submarine mission.

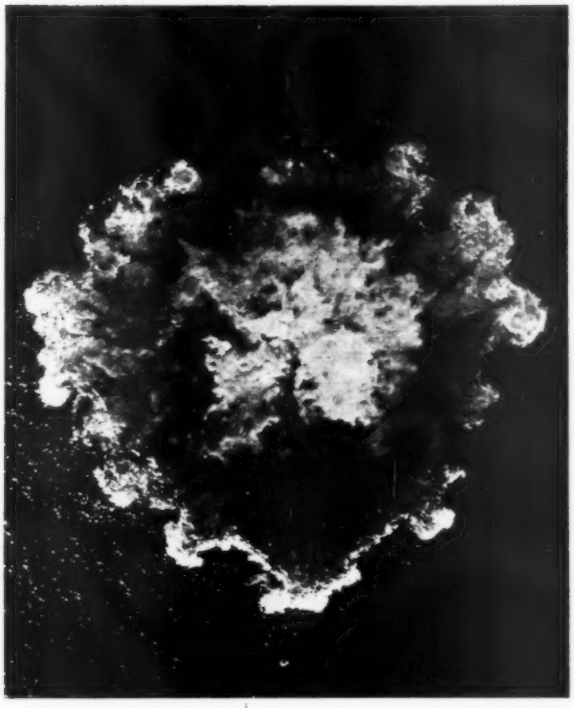
to establish, equip and maintain 10 air stations along the shores of the United States was approved.

However, the first World War broke out just after Stone had learned to fly and Hall had been stationed at Hammondsport for nine months. Stone was then assigned to duty with the Navy as a pilot on the cruiser *Huntington*. Hall was transferred to Buffalo to the office of the Inspector of Naval Aircraft at the Curtiss plant. Various other officers and enlisted personnel were assigned to training and indoctrination at Pensacola and afterwards detached to different Naval Air Stations in the United States and in France. Coast Guard aviation as a separate unit came to an abrupt end as a result of our entry into World War I, since its men and material were scattered throughout the Navy.

The second phase of CGA for the eight years following the Armistice was one of individual pioneering and experimentation. For example, in 1920 the Naval Air Station at Morehead City, N. C., was made available and the Coast Guard set up a tent hangar there. At that time Lieut. C. C. von Paulsen, one of the first and boldest pilots of the Coast Guard and now second in command of the Greenland patrol, borrowed a plane from the Navy and set up a hangar at Ten Pound Island, Gloucester, Mass. But the greatest contributions during this period were made by former Commander Stone, who was attached to the Navy. He was a co-pilot on the epoch-making eastward flight of the NC-4 across the Atlantic. He also helped develop the catapult and the retarding device now used on carriers. The third period, beginning in 1926, witnessed the real start. Congress, that year, appropriated an initial sum of $152,000. One air station was definitely established at Gloucester, Mass., and another at Cape May, N. J. Five small planes were purchased. The ball was rolling now.

Later, between 1932 and the outbreak of World War II, nine of the 10 air stations, authorized by the legislation of 1916, were built and put in operation at Biloxi, Miss., Brooklyn, N. Y., Elizabeth City, N. C., Miami, Fla., Port Angeles, Wash., St. Petersburg, Fla., Salem, Mass., San Diego and San Francisco, Calif. At these stations, all the latest improvements have been installed, such as seaplane ramps, landing lights, mooring buoys and other facilities required by seaplanes. More than half the air stations have runways so that the planes can land on the ground as well as on the water. Every

Coast Guard aviators searched and patrolled 17,842,231 square miles during first six months of war. Depth bombs, such as being attached to seaplane above, have accounted for a number of enemy U-boats (total is a military secret). Eruption below marks the terrific underwater explosion created when plane drops a depth bomb in vicinity of U-boat.



The Coast Guard's nine pre-war stations have been found adequate to handle the many new wartime duties assigned this hard-working branch. Flying officers are designated "aviators," enlisted men "pilots."

Area to be patrolled is carefully checked on map prior to take-off. Before his return, pilot may spot a sinking boat or survivors of a torpedoing, or attack a marauding submarine.

station has its own shop for overhauling and its own complete radio and communications center. There are new barracks and ample recreation rooms for the men.

The original five planes of 1926 were increased to 50 by 1941. Each one of these fitted some Coast Guard need. One example was the plane especially developed by the Coast Guard that was about 10 years ahead of its time and the forerunner of the present clipper flying boat. Essentially this plane was a seagoing vessel that could fly and was ideal for patrol and flying ambulance operations. One of these was of the JRF-2 and JRF-3 types while the remaining 23 were of the J4F-1 class. In addition to these there were 11 Hall flying boats of the PH-2 and PH-3 types.

The mission of Coast Guard aviation is also to assist the Navy in every possible way in convoy coverage and anti-submarine patrols. We have seen how in the last war, Coast Guard aviation had reached greater stature and had preserved its own unity for administrative purposes although its operations were under Navy direction. The Coast Guard Air Stations are manned as before by Coast Guard men under the direction of Comm. Frank A. Leamy, senior pilot and the headquarters chief of aviation operations.

The closest possible liaison is maintained with the Navy Bureau of Aeronautics and there is a Naval Intelligence Officer attached to each Coast Guard air station. The stations and planes are manned and operated by Coast Guard personnel while additional planes are procured as necessary from the Navy, both because they are more adaptable to the new wartime duties of Coast Guard aviation and because they are more readily available. The one most generally used is the single-engined OS2U-3 *Kingfisher* which is now employed by nearly every Coast Guard air station. These planes have been equipped with depth bombs and other armament to increase their effectiveness against submarines.

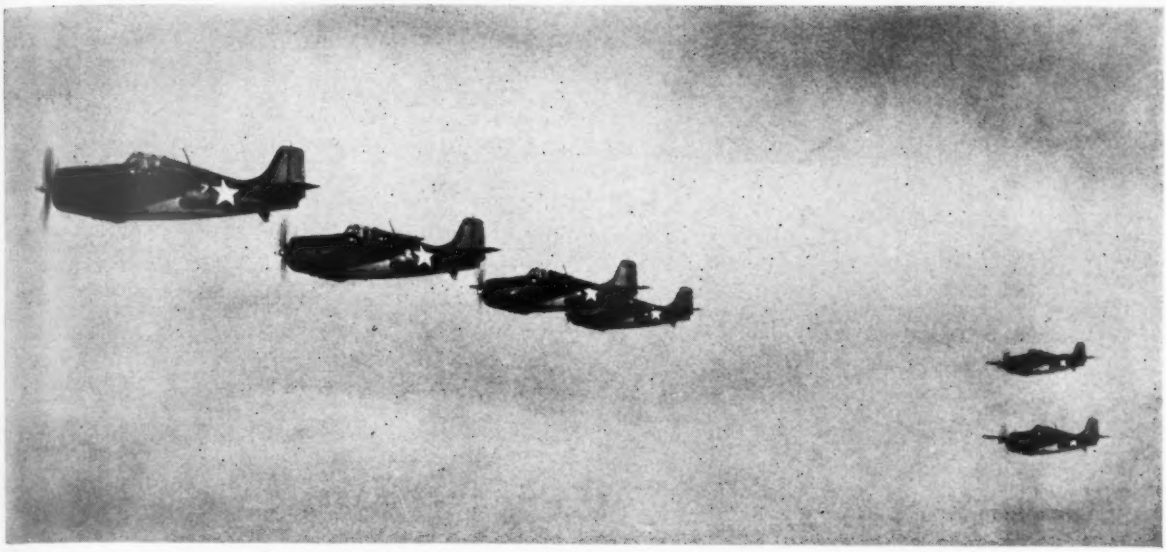
But the proof is in the doing. In the period between the start of hostilities on December 7, 1941, and June 30, 1942, Coast Guard aviators flew 23,442 hours during which 17,842,231 square miles were searched and patrolled while 2,245,357 miles were cruised. The normal routine of these patrols is exacting and tiring. In this same period there were 6,032 patrol flights during which 63,233 surface vessels and 12,951 planes were identified. When it is realized that the total strength of Coast Guard aviation is about 100 planes and 107 pilots, we see what a real job the Service has been doing.

The routine of these patrols is often interrupted by the rescue of survivors of torpedoed vessels. In the first half of 1942 there were assistance flights about three times the number of planes in service. Over 500 survivors were brought to shore.

The Elizabeth City air station, under the command of Lieut. Comm. R. C. Burke, is one center of these rescue operations. Two enlisted men there perfected the food bomb which is dropped to survivors of torpedoings in much the same way the Coast Guard dropped storm warnings to fishermen who lacked facilities for communicating with shore. The "food bomb" resembles a depth charge and has a soft concrete cap which disintegrates on contact with water. Its contents include seven cans of water, a first aid kit, a pint of whiskey, two food rations and several packs of cigarettes and matches. Harold V. Booth, AMM1/c, and Frederick J. Denio, AMM3/c, have since been officially commended for this invention.

A. M. Cupples, Aviation Machinist Mate first class and an aviation pilot, particularly distinguished himself in the rescue

(*Continued on page* 280)



Thach and his boys flew six-gun Grumman "Wildcats"; O'Hare since has taken command of VF-3 at sea.

'FIGHTING THREE'

This is the story of a typical Navy squadron—if you would call one of the most outstanding groups of its kind anywhere "typical."

THE transition of a story into legend is imperceptible. A band of men forms an organization to keep law and order, for example, and calls itself the Texas Rangers. It turns out that they are men of exceptional skill and daring; they perform feats that assume heroic proportions, and presently everybody is talking about them. Their accomplishments so capture the imagination that a long while after they have died people are still talking about them. They have ceased to be a story and have become a legend.

This war has seen the beginning of several such legends. The Marines at Wake Island will doubtless take their place in American history beside the defenders of the Alamo, and for generations to come the people of China will talk about the Flying Tigers. But the unit that has probably had one of the greatest successes on record against staggering odds is the Navy's Fighting Squadron Three. These fighter pilots, commanded by Lieut. Comm. John S. (Jimmy) Thach, were at San Diego, Calif., on December 7, 1941. On December 8, with half a squadron of airplanes and no combat experience, they boarded the aircraft carrier *Saratoga* and steamed off to war.

Lieutenant Commander Thach was a fortunate choice to command the squadron. Born in 1905, in Fordyce, Ark., he graduated from the Naval Academy in 1927, and then served aboard several ships. In 1929 he reported to the Naval Air Station at Pensacola, Fla., for instruction in flying. Then for awhile he served with a variety of aircraft squadrons, getting all kinds of experience. In 1935, he flew the first four-engined patrol bomber built in this country on a 25-hour non-stop flight from Norfolk, Va., to the Panama Canal Zone. A curious irony arising from this achievement was that later on, in one of the early Pacific battles, it was Thach who got the first four-engined enemy patrol bomber downed by the Navy in the war.

Tall, lean, nervous, Thach had always believed in drilling his squadron in gunnery, tactics, landing and taking off the carrier, and interception problems until all the members could do everything automatically, without even having to think. His insistence on thoroughness played a great part in the squadron's later, brilliant successes.

After a short stop at battered and still-smouldering Pearl Harbor to pick up a Marine fighter squadron as reinforcement for Wake Island, the *Saratoga* proceeded to Wake and then returned to Honolulu. Fighting Three went on offensive patrol duty, but in between flights Thach arranged with the Army Interceptor Command to use the north side of Oahu as a training area. For several weeks the squadron drilled hard, concentrating on gunnery. At the end of that time the *Saratoga* left Pearl Harbor, and Fighting Three embarked on the *Lexington*, headed toward Rabaul. "The *Lexington*," Thach has written, "was a ship administered in every way to enhance the value of the air group. The training of the air group at sea in gunnery and bombing was given high priority."

At 10:15 a.m. on February 20, the *Lexington* learned that several unidentified aircraft were about 35 miles distant. Quite understandably, an air of tension pervaded the ship, the tension every flyer feels before going into his first battle. The *Lexington* launched a combat patrol of six Grumman F4F fighters; two of these, under Lieutenant Commander Thach, shortly spotted a Jap four-engined patrol plane 43 miles away and shot it down. Two other Grummans, under Lieut. O. B. Stanley, located and shot down a second enemy patrol plane just after noon. The general impression was that a large Jap force was somewhere nearby and that the enemy patrol planes, before being shot down, had sent back a position report on the *Lexington*. At 3 o'clock it was learned that a group of planes was about 76 miles to the west and heading in at 8,000 feet. Six more Navy fighters were launched as a relief combat patrol; shortly afterward both patrols were instructed to intercept the enemy. The time had come for Fighting Squadron Three to test the tactics and skill it had been learning.

Both tactics and skill turned out to be fine. At 4:30 nine Jap bombers came in to attack. Fighting Three received them by knocking down five planes without delay. Four Japs dropped bombs which missed the ship by about 3,000 yards. As they started a hasty retreat, another bomber went down under antiaircraft and fighter fire, and then two of the remaining three were shot down by fighters. One Jap actually escaped. In the meantime, a second group of bombers was

O'Hare (left) and Thach pose with one of the squadron's aircraft computers shortly after O'Hare's famous feat. Note the five Jap flags on his plane. Thach now teaches in this country.

detected coming in from the east. All the fighters except two were pursuing the remnants of the first group and were not in a position to intercept. The two fighters available, led by Lieut. E. H. (Butch) O'Hare, turned to the attack. His partner's guns jammed, so O'Hare jumped on the bombers alone. He shot two down immediately and damaged others so that only four reached the dropping point. Then he shot down two more planes in flames and hit another, which later crashed. Altogether, O'Hare, single-handed, ended the war for five experienced Japanese flyers within a very few minutes.

One bomber, trying to strafe the bridge of the *Lexington*, was downed by antiaircraft fire. Of the four left of the second attack, one was caught and shot down eight miles away, another was caught and shot down 40 miles away and a third was downed by a *Lexington* scout 80 miles away. The fourth one, intercepted by one of the *Lexington's* scout bombers (which had been launched as anti-torpedo plane defense) was still flying, leaky and crippled, after a 150-mile running fight.

At 7 p.m. all the *Lexington's* planes were landed except two fighters which failed to return. One, flown by Ens. J. W. Wilson, crashed while attacking an enemy bomber; the other missing pilot, Lieut. (jg) H. L. Johnson, parachuted to safety. He was picked up by the *U.S.S. Patterson*. The box score of Fighting Three's first brush with the enemy was; two Jap patrol planes shot down, 16 out of 18 Jap bombers shot down and one of the remaining two damaged and probably lost. Navy losses were two fighter planes and one pilot. No damage was done to the *Lexington*.

Immediately after the battle the executive officer of the *Lexington* had the pilots narrate and record their stories before they had a chance to talk among themselves and possibly color the accounts. "It is most difficult to get a pilot to write a combat report," Thach has said, "because pilots in the heat of battle don't remember very well how many times they shot at the enemy and sometimes don't even know exactly how many planes they shot down. They aren't confused in action; they may go through the thing and do exactly right, but they just don't remember." The pilots stood around and recorded their stories before they even had time to get cleaned up. One pilot's clothes were soaked in oil, and another had a bullet hole through his trousers leg. Most of them were so keyed up they couldn't sleep that night.

"Next day," Thach has written, "I got my pilots together and pointed out all the mistakes I had seen that they had made and I had made—to keep them from being too cocky; but I was so proud of them it was hard to criticize. I had seen those mistakes because it was my job."

On March 10, 1942, Fighting Three, with bombers and torpedo planes from the *Lexington* and additional planes from the *Yorktown*, took off in the dawn and flew over the wild, unexplored mountains of New Guinea and attacked Jap ships, docks and installations at Salamaua and Lae. It was one of the most hazardous flights in the history of Naval aviation. In the opinion of a considerable group the planes, particularly the torpedo bombers, would be unable to clear the mountain ridge. The torpedo planes, however, did clear the ridge—by approximately 10 feet! Approaching the mountain tops, they were losing altitude at the rate of 600 feet a minute when their skipper spied a green, flat area and, remembering his glider tactics, maneuvered over it. The updraft from this place was sufficient to wash the planes over the hump.

While the other squadrons were causing general havoc, Fighting Three split into two four-plane divisions and went to work here and there. A dive on an antiaircraft battery at Lae resulted in the cessation of opposition from that sector. The squadron then attacked a cruiser, a destroyer, and a small auxiliary vessel underway off Salamaua, strafing the bridges and reducing personnel. They inflicted minor damage on buildings at Lae with machine guns and bombs. "We were disappointed," Thach wrote later, "to find no air opposition." One Jap seaplane turned up and started to attack. Lieut. Noel Gayler, commanding one of the VF-3 divisions, was making a dive when he saw the seaplane. He nosed up just long enough to fire a burst from his machine guns, knocking down the Jap, then continued with his dive. Altogether, Fighting Three killed about 50 men on the ground and on ships and created a satisfactory amount of wreckage.

Describing parts of the attack, Thach wrote, "When we opened up on the antiaircraft gunners the Japs left their guns and ran like hell. . . . The field (the airfield at Salamaua) was practically a total wreck. . . . This was a sort of picnic because we had no air opposition to speak of. It also showed the accuracy of the well-trained carrier group. We (all of the squadrons) destroyed everything worthwhile in that vicinity. If we had had a small landing force of Marines we could have walked right in and taken the place, but we didn't have the equipment."

An interesting footnote to this raid was the rescue of a cruiser-based scouting pilot who had been forced down when the task force was steaming into position for the attack. Caught by bad weather, he kept radioing long dashes so that the ships could take a bearing on him. "They sounded like long, pitiful wails," one of the pilots said later. "It was heartbreaking to hear him. The wail stopped and we hoped he had landed somewhere." A carrier sent scouts looking for the plane, but without success. However, on the way back five days later the admiral had not forgotten the youngster. Having carefully computed the tide and drift, he directed the force to intercept the plane if it was still afloat. The plane was not only afloat, but the pilot had the engine going and taxied up to the cruiser under his own power.

Fighting Three returned to Honolulu, having lost an average weight during the expedition of 12 pounds per man. It was decided at Pearl Harbor that Lieutenant Commander Thach would remain there to train some new pilots who had arrived and that his squadron would go to Lieut. Comm. Paul Ramsey, commander of Fighting Two, which went aboard the *Lexington* and headed toward the Coral Sea. The old VF-3 boys working under a new banner did very well. The Battle of Coral Sea started early in the morning of May 7. Several scout bombers, launched at dawn from the *Lexington*, reported discovery of two enemy carriers, two cruisers and two destroyers.

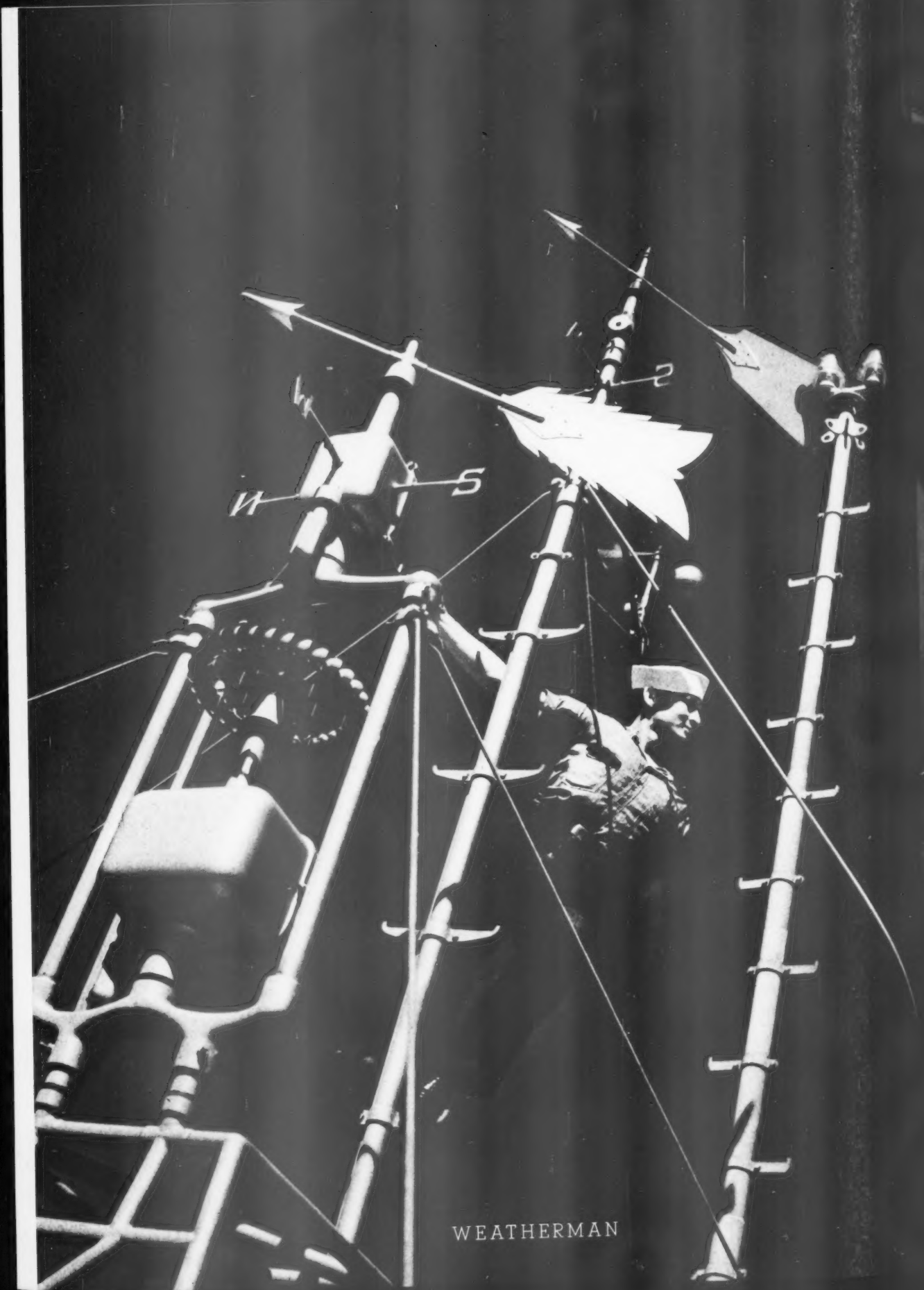
(*Continued on page* 222)

Duotone Portfolio

The eight pages following contain some striking, unusual photographs taken by Navy aviation cameramen in various theaters of action during recent months.

DESTROYER

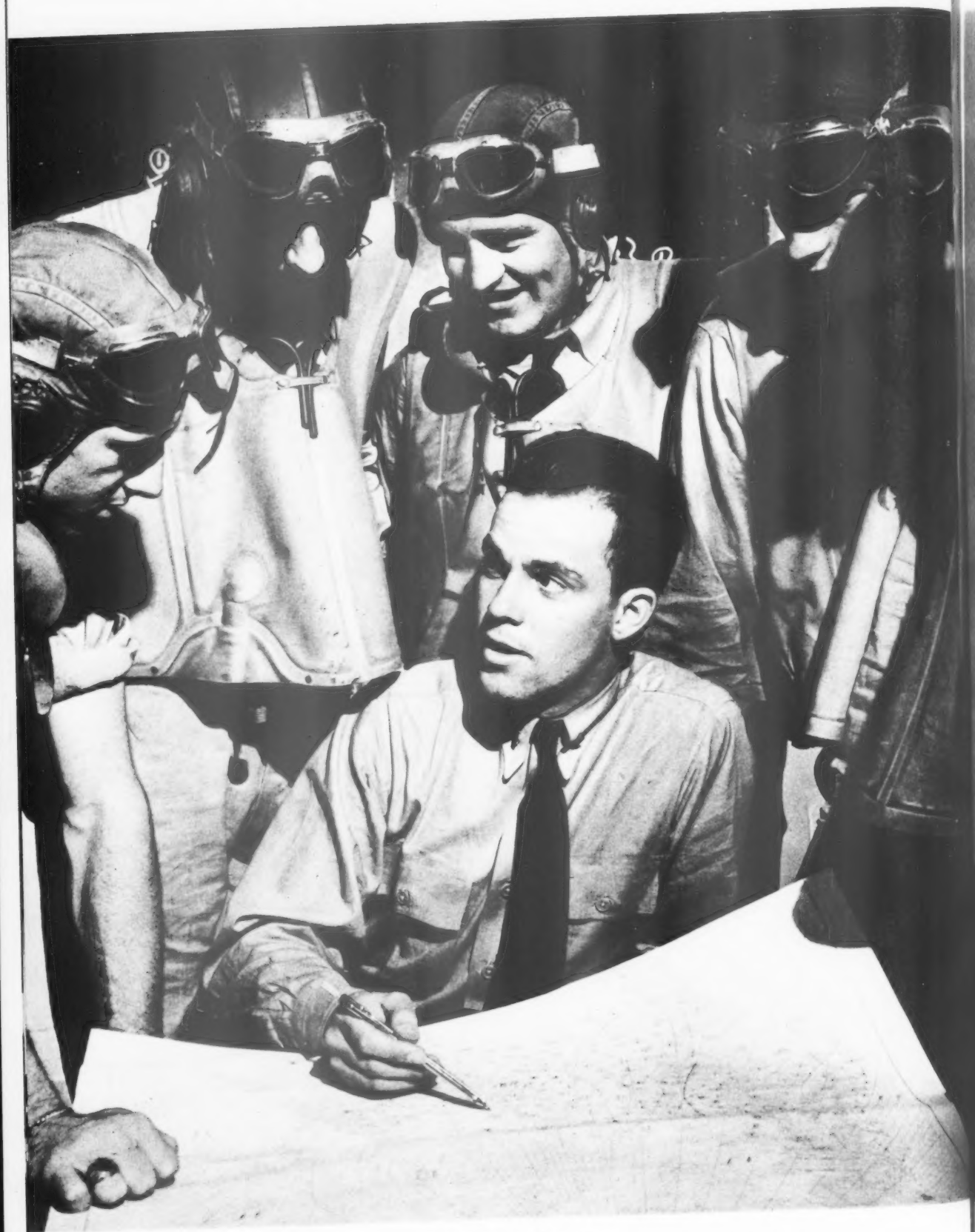
By HANS GROENHOFF


WEATHERMAN

TORCH WELDER

AT EASE

KINGFISHER



AEROLOGIST

FIRE FIGHTERS

CARRIER LANDING

AIR TRANSPORT

Loading crane swings aircraft engine into position for loading aboard this R4D, for shipment via Naval Air Transport Service.

The Navy's air transport service now is flying 30,000 miles daily, carrying men and equipment to far-flung war stations.

by Comm.
C. H. SCHILDHAUER

Commander Schildhauer, officer-in-charge of the Naval Transport Service, served as an enlisted man in the Navy from 1913 to 1915, at which time he received an appointment to the Naval Academy. Graduating in 1918, he served many sea assignments prior to being ordered to duty at the Naval Aircraft Factory. He was active in creating Pan American's transoceanic service.

FEW people realize what the Navy's air transport arm is doing in this war. It is not the kind of aviation activity that gets much publicity: the word "transport" conjures up no exciting pictures of pilots shooting at each other with machine guns or dropping bombs on the enemy. It sounds as dull as a middle-aged commuter's daily haul to and from the city.

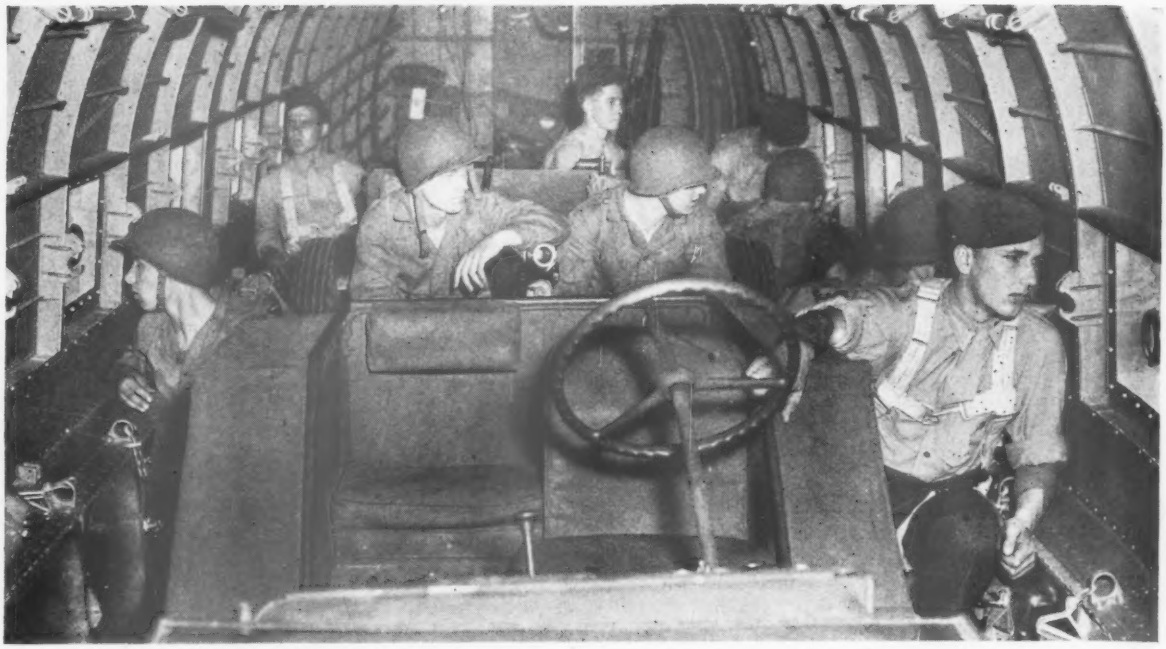
The facts present a slightly different version of this important service. Now, during this war in which we are engaged all over the world, Naval air transport is flying, and strictly on schedule, no less than 30,000 miles a day. Our giant cargo planes are leaving, at intervals of only a few hours, for places as far distant as Iceland, Greenland, Australia, Alaska and Honolulu, to name a few. These are trips of vital importance to the Navy's successful conduct of the war, and they are carried out with the clockwork of a commercial run between New York and Boston.

The mission of these planes is hardly dull. They are engaged in evacuating wounded from the battle zones, transporting personnel for combat, carrying essential supplies up to the fronts, and in performing the myriad dangerous tasks necessary to keep the Navy in the fight and working at top efficiency. In addition, they are importing from far-off countries commodities essential to our manufacture of war materials, commodities which now could be imported in no other way. Balsa wood—needed to make gliders and mosquito boats—has been flown up from Central America; 20 tons of rubber seeds for planting in the western hemisphere were brought from Liberia, and a cargo of beetles were flown from the Fiji Islands to Honduras to check a weevil that was destroying hemp on an experimental plantation. These are a few examples.

At the outset of World War I a congressional committee raised the question, "How many torpedoes will we need to fight this war?" A Naval officer answered by saying, "Just half as many if we have a good transport system." This sentiment is doubly pertinent to today's war, with its quick mobility, scattered forces and new dependence on aerial combat.

Naval transport had its genesis in the first World War. In the beginning commercial vessels were used to keep the Navy supplied with men and materials. This system worked imperfectly; in some cases the crews of the commercial ships were badly trained, all too frequently there was not enough space available for Navy cargoes, and in a few deplorable instances the commercial ships' officers were reluctant to go into or near hostile waters. It became apparent that if the Navy were to keep afloat and in the action a transport system of its own would have to be developed. In the winter of 1918, the chief of Naval operations issued an order establishing the Naval Overseas Transportation Service, which functioned with laudable efficiency but which, after the war, was radically reduced in size.

When Hitler's hordes began swarming over Europe in 1939, a new kind of warfare, in which control of the air was paramount, took shape. This was a war covering long distances; quick thrusts by legions of big bombers and fighter planes effected the capitulation in a very short time of armies and navies far distant—that would previously have taken months



A cargo transport plane (R4D) being used for air-borne combat service. Note 37 mm. anti-tank gun between Marines in "jeep."

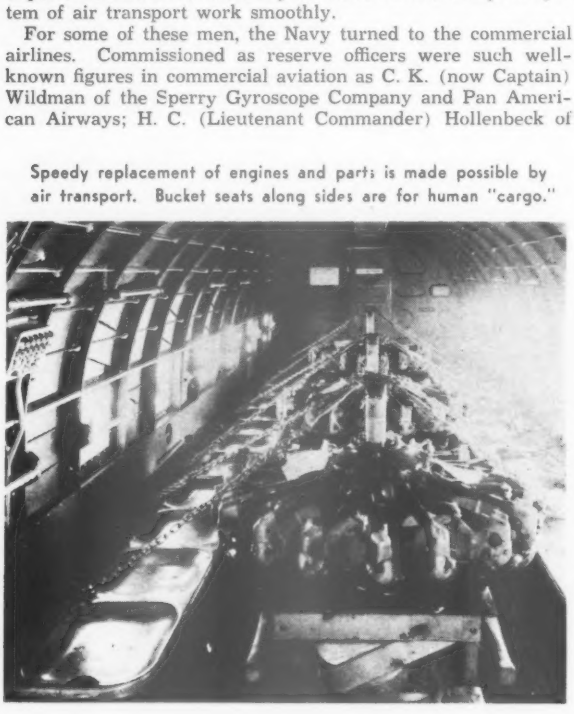
to attack successfully. Troops were carried hundreds of miles in a few hours and dropped on the opposing forces by parachutes. Obviously, this created a new and difficult supply problem, the logical solution of which was, of course, to be found in the air. On December 12, 1941, Secretary of the Navy Frank Knox authorized the establishment of a Naval Air Transport Service. The task of this fledgling organization was tremendous; first of all it had the job of establishing an important auxiliary to the surface ship transport system; then there were schedules of operations to be worked out; finally, and perhaps most important, men had to be found with the experience and skill necessary to make such a complex system of air transport work smoothly.

For some of these men, the Navy turned to the commercial airlines. Commissioned as reserve officers were such well-known figures in commercial aviation as C. K. (now Captain) Wildman of the Sperry Gyroscope Company and Pan American Airways; H. C. (Lieutenant Commander) Hollenbeck of Western Air Express; V. A. (Lieutenant Commander) Dorrell of Pan American Airways and later vice president of Mid-Continent Airlines; Karl F. (Lieutenant Commander) Lueder of Ryan Aircraft and Pan American Airways; W. F. (Lieutenant Commander) Larned, senior pilot of United Air Lines; and J. A. (Lieutenant) Fiske, who was operations engineer for Pan American Airways and then on special duty with the Royal East Indies navy for the Glenn L. Martin Company. These experienced airmen, together with regular Navy aviation veterans like Capt. S. L. LaHache, Lieut. Comm. H. A. Elliott, and Lieut. P. J. Byrnes, and a few reservists like Lieut. H. R. Canaday, a graduate of the Naval Academy, were the early important figures of the transport service and are still its outstanding members today.

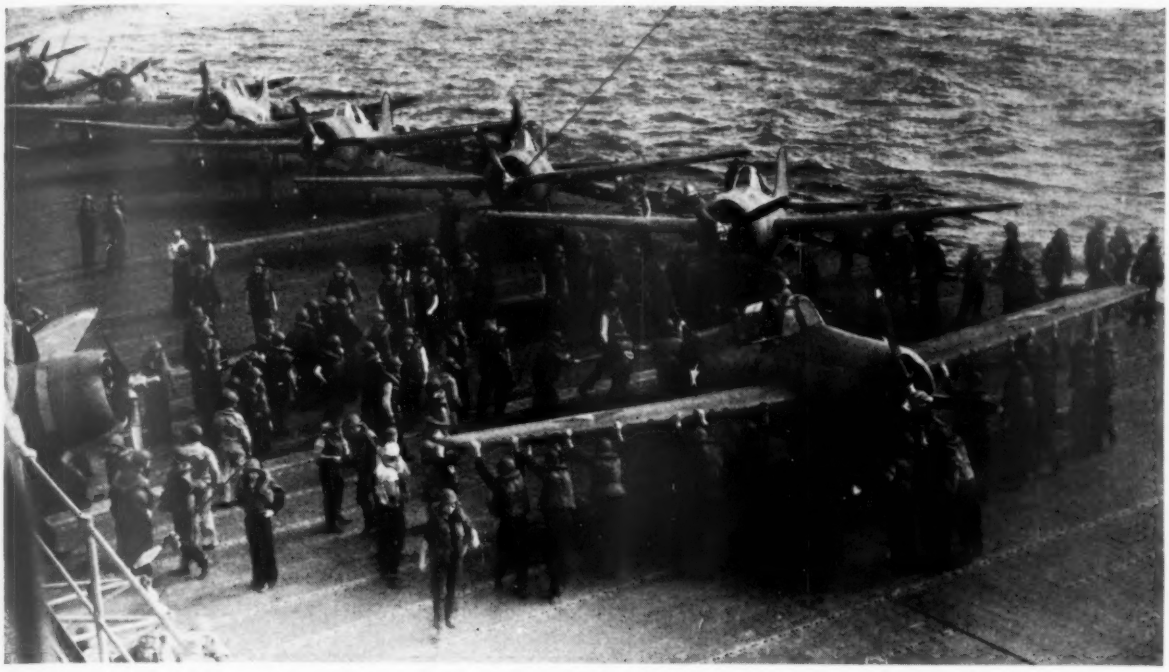
Operating on the heartening directions of Secretary Knox to "cut through red tape," this excellent staff nucleus went to work and things began to hum. To Norfolk went Captain

(*Continued on page* 236)

Speedy replacement of engines and parts is made possible by air transport. Bucket seats along sides are for human "cargo."



Standard, lightweight packing cases carry small items being packed away in DC-5. "VMJ" means "Aviation Marine Utility."



Efficiency of all carrier operations depends on the abilities and initiative of ground crewmen.

GROUND CREWS

Pilots usually get all the glory—not that they don't merit a lot. But the unknown, unpublicized man behind the man behind the controls already has emblazoned his story in air-war history.

THE heroism of Naval aviation's ground crews started early in this war. It started, to be exact, during the first attack the Japanese made on the Naval Air Station at Kaneohe Bay, Honolulu, on the morning of December 7, 1941.

John W. Finn, an aviation chief ordnanceman, one of the men who stay behind so that the planes can stay in the air, was in the vicinity of a parking ramp when he first heard the heavy drone of enemy engines. Seconds later he was ducking for cover—low-flying Jap fighters, the ugly orange symbol of the rising sun agleam on their sides, were thundering over, spitting machine gun bullets and cannon shells at the men and buildings below.

Finn, 32 years old and a Navy man for 15 years, ducked for cover only briefly. Like everybody else in Honolulu on that morning, he got mad quick. There was a machine gun within easy access, on an instruction stand near the ramp. Also, to quote from Finn's subsequent citation for the Congressional Medal of Honor, it was "in a completely exposed section." Apparently, its exposed condition hadn't occurred to Finn, for he jumped on the stand, grabbed the gun and opened fire.

The Japs, expecting no opposition and flying close to the ground for strafing, must have been disagreeably surprised. A blistering chain of bullets from Finn's machine gun started ripping into their planes. Moving higher, the Japs began to concentrate on removing the source of their annoyance. They neglected some of the objects they had planned to strafe and directed their fire toward Finn. They hit him frequently, on each of which occasions he seemed to take on new vitality, redoubling his efforts and making it warmer for the enemy. He caused considerable damage, and he more or less drove the Japs away from that area single-handed.

At length, after his wounds had become numerous and painful, Finn was advised to seek medical attention. He disregarded the advice, however, and continued his activities with the machine gun. Finally he submitted to an outright order of one of his superior officers and went to the first aid station. After receiving attention, he returned to the squadron area, where he supervised the rearming of returning Navy planes. "His extraordinary heroism and conduct in this action," reads his citation, "are considered to be in accord with the highest traditions of the Naval service."

They are indeed.

Reading the publicity deservedly given to courageous Navy and Marine plane crews, the public is inclined to forget that each of these has a crew of men on the ground, or on a carrier, depending on which type of squadron it is, who are vital to the success of its operations. The machinists' mates, the metalsmiths, the ordnancemen, radiomen, yeomen, seamen—yes, and the messboys, the cook and the baker, play a most essential role in keeping their squadron in the fight with smoothly-working planes and equipment.

This role of the ground crew is not only essential but exciting. For descriptive purposes let us consider the following case: We are at war and on a big carrier. Its fighter squadron

is coming in, the planes are in the landing circle, ready to come aboard. The signalman waves his paddle; the first fighter throttles down and hits the deck. At this instant a swarm of men, each in a colored jacket that identifies his classification, runs out to the plane and hustles it forward, where they feverishly begin the work of repairing and refueling it and reloading its guns. Each plane as it comes in is treated similarly. The job has to be done fast. The squadron has just carried out a successful attack on a nearby enemy task force, and in 15 minutes will be called upon to intercept two squadrons of Jap dive-bombers and torpedo planes. The very life of the carrier is shortly to depend on the fighters, and the fighters, in turn, are depending on the efficiency of their ground crews. Unless the gun belts are quickly reloaded with .50 caliber bullets, unless the planes are refueled with high octane gas, and unless the fouled plugs of one and the radio failure of another are corrected, the fight may be lost. (It should be observed in passing that in this particular case every man did his duty as usual and the attackers were chased away with heavy losses.—Ed.)

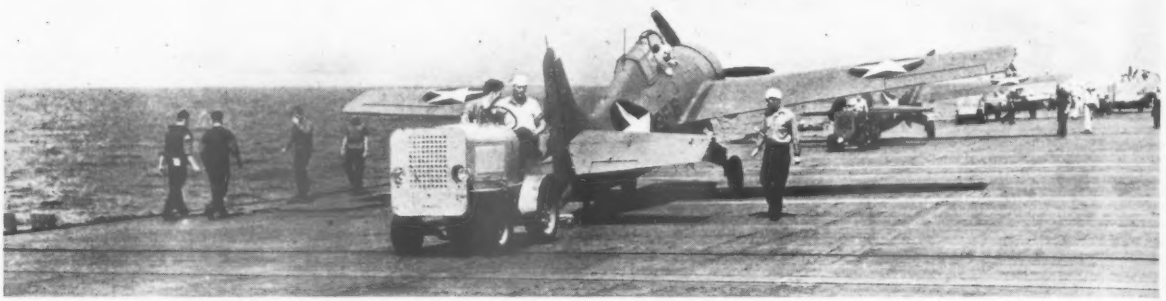
Skipper of the ground crew is the plane captain, usually a chief petty officer, who supervises the work and assigns the men under him to their duties. Total size of a ground crew varies, since multi-engined planes require many additional men. In peacetime, the crew will be attached permanently to a certain squadron, and will move with it from ship to ship, or station to station. This sense of permanence creates loyalty within the squadron, each unit realizing its dependence on the other, and a high degree of co-operation is achieved. In wartime, carrier squadrons shift from ship to ship, since it is unfortunately true that ships are occasionally shot at and sunk, not only the enemy's but our own. When pilots have to change their berth they generally put up a strong plea to take their ground crew with them, but this is often impossible.

"We get used to the way our ground men do things," a dive bomber pilot explained not long ago, "and they know just how each pilot wants his plane kept. For example, when I come in the mechs grab my ship and wash the wings before they do anything else. It's a kind of superstition. Another pilot, Addams, who's from the south, has a couple of food peculiarities. The cook fixes him pork chops and hominy grits for breakfast on mornings when it looks as though we may have a scrap coming up. He says it makes his stomach happy and he can fight better. The baker gets up some kind of horrible looking meat pie for one of the radiomen—we think he puts sea gulls in it, although we never have been able to prove it."

Members of ground crews are trained, as are the technicians of flight crews, at one of the Navy's numerous technical schools. After a course ranging from three to six months they get an aviation rating as machinist's mate, metalsmith, ordnanceman or radioman. By graduation each is a competent skilled craftsman, ready to fill an important post in Naval aviation. The radioman, for instance, has learned among many other things, how to operate and maintain all the radio equipment used by the service; he has a thorough knowledge of radio receivers, transmitters, direction finders and power supplies; he understands calibration, frequency adjusting, radio installation, and the airplane interphone system; and he has, besides, mastered the use of all the tools required in the maintenance of this equipment.

The ordnancemen are concerned with firepower. They check and synchronize the machine guns, they load the bomb racks of the dive bombers, and they lash the "tin fish" to the torpedo planes. In addition, they take care of such important items as the installation of pyrotechnic incendiaries, float lights for taking drift, rockets for identification, and parachute flares for illuminating enemy targets. An ordnanceman is responsible for everything with which a plane fights. Obviously, that covers a lot of territory, which also includes a knowledge of the composition of bombs and bomb fuses, safety precautions, storage of small arms, preparation and maintenance of towing equipment, and the synchronization of propellers with machine guns and cannon. Moreover, an ordnanceman must always be right; when the time comes for a pilot to use his machine gun it *has* to fire.

The machinist's mates (or mechanics), and the metalsmiths are concerned chiefly with repair work. The Navy or Marine aviation mechanic knows all about maintaining airplanes under any sort of conditions. This means that he may be called upon (during one brief attack) to repair holes and tears in fabric, adjust hydraulic systems, correct propeller pitch, unclog feed lines, and tune up ignition systems—in short, he might find it necessary to dismantle a plane almost completely and put it back together again, or, as in the case of the Marines at Wake Island, to build a whole new plane out of the parts of wrecked ones. To bring off this last operation would, of course, require the assistance of the metalsmiths, who are experts at soft soldering, welding, cutting, finishing and heat treating of metals. Given a few bundles of miscellaneous materials, pilots say, the Navy's mechanics and metalsmiths could probably build a workable dive bomber in 20 minutes or so, and convert it into a fighter an hour later.



Ground crewmen assigned to certain planes usually stay with their pilots and planes, despite transfers of the squadron. Led by the plane captain, each man in the crew of this wildcat has a specified job.

During the last two weeks of their training course these technicians in ground crews all work together "on the line," that is, under the actual conditions of squadron operations. Thus, by the time they have reported for combat duty they have the feel of their work and can function with efficiency born of experience. The yeomen and seamen of the crews help tend the planes and perform various aviation duties. Among other things, they man the arresting gear, act as plane directors and spotters, as talkers, reporting deck operations to their superiors, as fire fighters and gas crewmen, as recorder, as hook spotter, and in several other capacities, depending on the nature of their squadron. The work of some of the other crew members—the mess boys, cook, baker, etc.—needs no explanation. They all function as a big team, and their interest in the success of their squadron is no less keen than that of the pilots themselves.

Asked how the members of a squadron groundcrew feel when their planes take off for a battle, a Marine metalsmith at Guadalcanal said, "I don't believe there's a single man of us, including the cook, that wouldn't give his shirt to be going along. We all stand there watching the planes take off, hoping that nothing will go wrong with any of them, and hoping

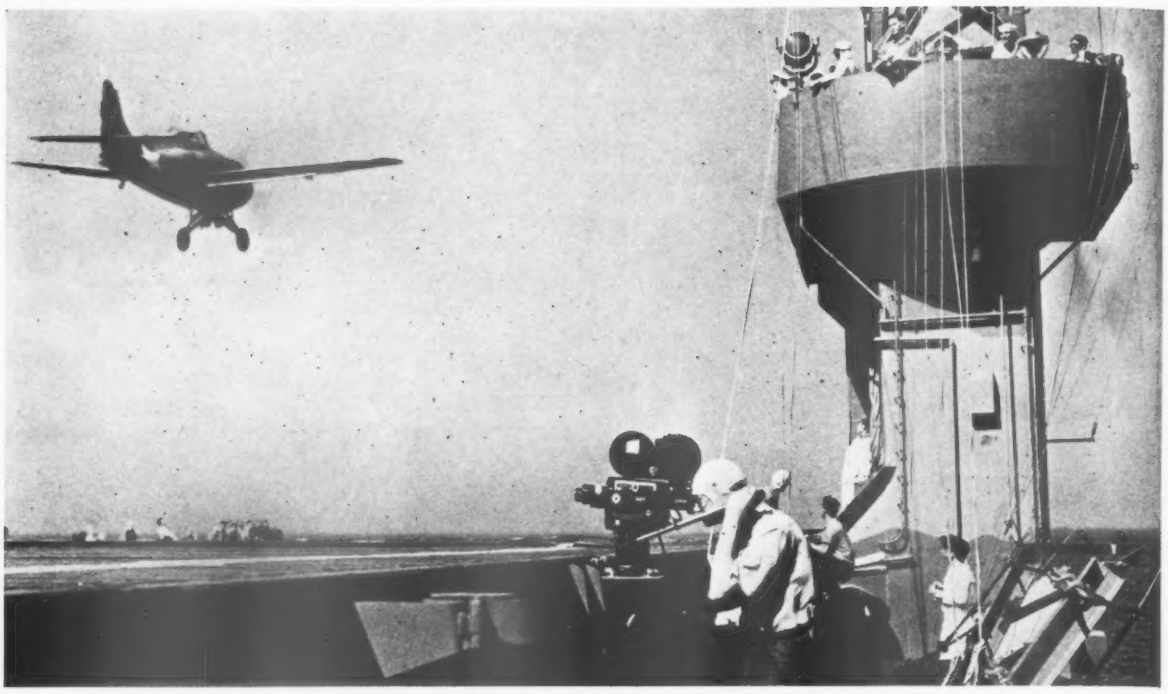
(*Continued on page* 300)

PHOTOGRAPHY

The camera, a tool as well as an historian, is on combat duty from the time a battle is planned until it has ended.

One of the Navy's flying motion picture cameramen.

PHOTOGRAPHY



The camera not only makes possible an indelible record of tactics and training, but often provides a visual basis for flight improvement. Here the photographer "shoots" a Grumman F4F "Wildcat" passing carrier's control tower.

"We are fighting a war for democracy and one of the tenets of democracy is an informed people . . . While this war is being fought, and after we have won it, I am sure that the naval photographer's camera will mirror a true picture of our aims, our might and our victory."

—Frank Knox, Secretary of the Navy

by Capt.
L. A. POPE

In 1917, Captain Pope left the Colorado School of Mines to enter the Navy. As a Naval aviator and an expert in aerial photography, he was in charge of the Naval photographic school at Pensacola in 1923-24. He recently was transferred to the Bureau of Aeronautics at Washington, as director of flight, after serving as commanding officer, Johnston Island Naval Air Station.

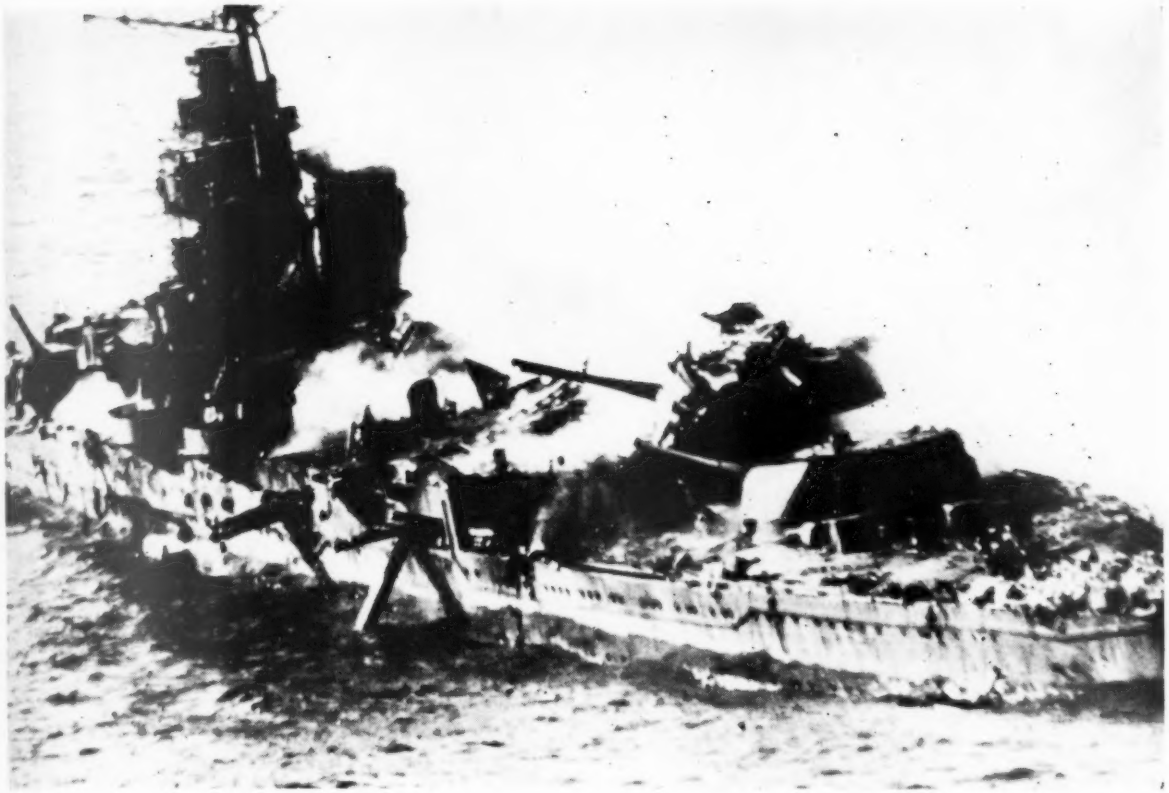
BY the nature of things, the combat air photographer would seem to be a sardonic individual. His is the job of playing hob with the enemy's best-laid plans by making them the worst-kept secrets of the war. For when our fighting photographer politely tells the enemy to "look at the birdie" he is referring, of course, to the American eagle.

Actually, however, the photographer is in no sense a cynical type. He is an expert craftsman performing the kind of work he knows best. And it is precisely to the degree that he succeeds in peeking through his stratospheric key-hole, catching and recording an eyeful of what's cooking on the wrong side of the tracks, that he makes himself professionally welcome in the company of the officers and men who speak his language.

For it is becoming ever more apparent as events develop that no battle of importance will be fought for which cameras have not paved the way. It is true that aerial reconnaissance for mapping enemy terrain, locating gun emplacements, scanning topography and so forth is at the moment the most important assignment upon which our photographers embark. Still, it is not to be forgotten that constant alertness is required in the observation of enemy vessels, both docked and under way. (The Germans attempted to camouflage the *Scharnhorst* out of existence—and flopped with a thud.) Other camera "targets" are air fields, troop concentrations, harbors and bays, antiaircraft batteries, enemy cities, villages, transportation systems and inland waterways.

Two widely separated areas of our globe constantly require aerial reconnaissance for photographic purposes. The British must watch the shoreline of the European continent day and night. The American Navy looks forward to its continued operations in the island-dotted waters of the Southwest Pacific —and wants pictures. Where aggressive, offensive movement is the order of the day, the photographer and his pictures become intimate comrades of the men of the ships, the infantry, and the machine-gunner.

In the gray wastes of the Pacific, each new acquisition by the American Fleet is accepted by the cameramen as a kind of personal gesture in their behalf. As one recently returned photographic expert puts it: "If the Navy takes an island, it is a strategic victory for those of us who photograph the war. Each new square mile of earth retaken means that much more operating space for us. Without bases from which to operate, we, too, suffer from the hazard of space and distance. In the Solomons, for example, we take a new lease on life, since wherever we can land we can set up new laboratories and new housing for equipment. We picture people get a big



Air intelligence officers had, in this unusual aerial photograph, definite proof of the wrecking of a heavy Jap cruiser during the Battle of Midway. Carrier-based planes did this.

A Japanese carrier under attack by Navy bombers and torpedo planes lists as near-hit sends geyser high above ship's deck. Photographer's plane flew close to get this Coral Sea episode.

kick out of every inch of expansion in the South Pacific. For that matter, who doesn't, except the Japs?"

The absence of adequate maps of the islands in the South Pacific and of areas in the North Pacific, the Aleutians, Greenland, the coastal vicinity of South America and elsewhere is now being rapidly erased. In its place is being woven the fulfillment of the cartographer's dream—a mosaic map and chart of the earth's surface, made possible by the ingenuity and daring of the flying picture maker. From the stratosphere to the crest of the waves the cameraman is ever on the move.

But taking the pictures is only half the story. Aerial views of hostile coast-lines being the immediate job before our cameramen, for obvious reasons, the highly exacting business of the interpretation of aerial photographs is logically next in order. Here we enter upon a field so sensitive and so vital that we hesitate to tell much about it. But there's no law prohibiting the assertion that Naval authorities look upon the work of its interpretation experts as an indispensable part of winning the battle.

In the quiet of the laboratory these men study each print, seeking to learn its story, puzzling out its hidden meaning. With the growing necessity for familiarizing our forces with shore-line topography, the development of the art of the stereophotographer has taken on a new pace and a new enthusiasm. The old parlor pastime of viewing grandmother's tinted landscapes through the stereoscope has its counterpart in this war.

Aerial photographs are put together so that they afford the observer an accurate all-dimensional picture of terrain over which he expects to operate—heights, depressions—all placed at his fingertips with scales of measurement in distances which, thanks to the interpreter, acquaint the marine or the soldier with the countryside long before he ever sets foot on that soil. Here, in the Navy's view, is a department of modern warfare which, although silent and unheralded, achieves heroic proportions by application.

But not all Navy pictures are sealed in the depths of intelligence files. Some reach the American public to tell, more vividly than words, the story of the war at sea. And, ever-

Officers and crew of the "Lexington" slide down ropes or jump to get away from famed carrier lost in the Coral Sea.

A Navy photographer on a reconnaissance flight caught this view of U.S. troops landing in barges on the African coast.

lastingly to his credit, as he zooms his way through shell-burst and storm and fire and lead, the American military cameraman is no partner in a conspiracy of propaganda fraudulently designed to deceive his own people. When, for example, the valorous *Lexington* is crippled, her starboard deck awash in the Coral Sea, his camera records the scene, brings graphically home the moment when her officers and men slide and leap into the water. At Midway the *Yorktown* ablaze and in her last struggle is photographed from the air and the pictures are flashed across the homeland from coast to coast for newspaper and newsreel reproduction. Shrewdly, resourcefully, the photographer makes masterly use of a submarine periscope to record by camera the list and despair of a Jap destroyer, members of its crew scrambling on its bridge, the symbol of the rising sun already awash and slowly sinking.

The Navy photographer is busy. And he has just begun to fight. At this moment he is thinking ahead, of transmitting pictures from his plane back to headquarters, of using natural color, of miles-high telescopic exposures far up beyond the range of antiaircraft, of squadrons of camera planes specially equipped, specially heated, specially engined for his purpose.

Whatever new developments are to come, we can be sure that they will add invaluable records to the story of the defense of freedom. Imagine the regard with which the nation would view a photograph—yes, a motion photograph—of Washington's farewell to his troops—Lincoln at Gettysburg—Roosevelt on San Juan Hill! Yet now we find ourselves in the hour of assembling for posterity a library of pictorial episodes which may well surpass even these historic passages in the history of the Nation . . . A motion picture cameraman rides high in a plane as it circles warcraft at sea, somewhere in the North Atlantic . . . the plane settles . . . a second cameraman on the deck of the warship trucks up to the head of a ladder, stops . . . Winston Churchill, Prime Minister of England, emerges, waves, bites into his cigar, turns across deck. The camera wipes, comes to an abrupt halt. Franklin D. Roosevelt, President of the United States, steps into the scene. President and Prime Minister shake hands. They turn to the camera . . . smile. The Atlantic Charter! The Four Freedoms! . . . A powerful, miniature PT boat racing through the storm-tossed South Pacific, reaches port, disembarks its lone passenger . . . Gen. Douglas MacArthur! . . . Joseph Stalin faces his forces at the gates of Stalingrad: "Stand here, and die, if you must; but stand here!" Gen. Jimmy Doolittle stoops a little over the seated President of the United States in the White House. On the Doolittle lapel is being pinned the Congressional Medal of Honor.

(*Continued on page 275*)

Black bursts show intensity of anti-aircraft fire as four Japanese bombers, flying low, attempt to attack U.S. transports (extreme left). Action took place in the vicinity of Guadalcanal Island.

CONVOY

Naval aircraft are proving certain death to submarines.
U. S. planes now herd convoys much of the way across the seas.

Aboard an unnamed U. S. carrier accompanying the convoy to North Africa.

Part of the huge convoy (totaling more than 800 ships) bound for Africa and the opening of the "second front."

CONVOY

by Comm.
A. B. VOSSELLER

Commander Vosseller was born in Jacksonville, Ill., January 25, 1903. He graduated from the Naval Academy in 1924 and served on the U.S.S. "Mississippi," after which he served in destroyers until 1930. He then entered Pensacola, qualifying as a Naval aviator on March 2, 1931. Author of the recent motion picture "Wings of the Navy," he now is stationed at the BuAero.

GENTLE winds rippled the surface of the Atlantic as the big Navy patrol bomber droned steadily onward. With the sun at his back, the pilot stared miles ahead at the steel-blue mirror below him. Suddenly he stiffened in his seat, rapped sharp instruction into the intra-plane phone, galvanizing his monotony-ridden crew into action, then opened his throttles wide.

Dead ahead, about seven miles distant, a large Nazi U-boat was cruising on the surface—a target the pilot and his men had dreamed of for months! As the big plane nosed over and roared down towards the sub, the bombardier opened the bomb bay doors and hurriedly set the switches in the required combination to arm and release the bombs at the proper instant.

While the plane still was about a mile away, it apparently had been spotted, for men on the deck and conning tower of the sub could be seen scrambling to get below. Even before all of them succeeded the U-boat started to crash-dive. It was too late, however. The plane's first bomb struck just under the stern, lifting the sub violently into the air. There was a good deal of cussing by the plane crew when another bomb lit harmlessly on the sub's deck and lodged in the wooden grating forming part of the deck casing, some 15 or 20 feet astern of the conning tower.

As the plane went over, a heavy-set man wearing an officer's cap was seen to be still on the bridge. By the time the plane had circled for a second run, the U-boat was almost out of sight but a few seconds later the plane crew cheered at the appearance of a tremendous plume of water—the explosion of the bomb which had stuck on deck! Its delayed fuse had operated after the sub had reached what its crew probably thought was a safe depth. A big patch of oil floated to the surface, accompanied by furious bubbling of air and large pieces of deck planking, mattresses and clothing.

It is against Navy Department policy to make outright claims of U-boat destruction, but let us say that there is no record of this particular sub doing any further damage to United Nations' shipping.

Stripped of all detail which might be of value to the enemy, this incident nevertheless is descriptive of the value of aircraft in protecting our convoys and shipping in general. The airplane provides the split-second speed which is so essential in capitalizing on the discovery of a sub on the surface. Although ships have sailed in convoy since before the days of the Spanish Armada, it is not too much to say that the use of aircraft in conjunction with the convoy system has greatly increased the effectiveness of the latter.

One of the favorite tricks of the modern Nazi pirates is to pick up the trail of a slow-moving convoy and use their superior speed when running on the surface to get ahead of the merchantmen at night, then lie in wait at a point where they can launch a surprise torpedo attack at dawn. Aerial patrol of the sea lanes helps us to keep the subs below the surface during the daylight hours, drives them away from entrances to harbors from which convoys depart and thus makes it much more difficult for them to locate their prey.

Results of the co-ordinated air and surface anti-submarine patrol nowhere have been more striking than along our own Atlantic seaboard. In the early days of the war, this area provided the U-boats with some of their best hunting but since the counter-measures have gotten into full operation, sinkings have been just about nil.

Modern convoy is not solely defensive except in the sense that the escort, both air and surface, usually must wait for the unseen assailant to approach his intended victim before he can be attacked. This involves much tiresome waiting for the enemy to appear, and seemingly endless hours of flying, the majority of which are unproductive of action. Of course, our Naval aviators realize that many submarines sight them and dive hastily to avoid attack without ever being seen themselves. But the flyers also know that this is a valuable contribution in itself since a submerged submarine is unable to see anything and, due to its greatly reduced submerged speed, is relatively stopped in its tracks.

Since the last war, tactics of submarine warfare have changed greatly; both the tactics of the submarine and the tactics of the convoy escort. Obviously, not a great deal can be said about the exact measures which have been developed in affording security to the convoys and attacking U-boats which attempt to interfere, but it is worth repeating that most of the time this duty, so far as pilots are concerned, at least, is extremely monotonous.

There is ample evidence that the U-boat has a deathly fear of aircraft. We also have several excellent indications that their crews are not well conditioned psychologically to withstand a deadly attack on themselves, attacks against which they are just as helpless as most of their victims. Some of these instances would be of the utmost value to the enemy

and cannot, therefore, be discussed. However, one of the most revealing was reported in the Boston *Globe* of September 4, 1942, the result of a short wave listening post pick-up from Germany. Extracts from this broadcast which appeared in the Boston *Globe* are quoted for the illuminating features contained. The one quoted herewith came from a captured U-boat captain, now a prisoner in the United States. He was writing to his admiral to excuse his failure:

"Dear Admiral:

"I am very sorry that fate has not permitted me to return and report to my Supreme Commander. A cruel fate has wrested the arms from my hand. Our boat was sunk through the mistake of one of our men. But I do not want to blame him because he had not had enough experience. I assume that you have already received the names of the survivors of our craft through the Red Cross. It is terribly hard for us here to be prisoners of war while our comrades are heroically doing their duty. But though we drew an unfavorable lot, we must nevertheless be grateful because Providence has at least saved our poor lives. Only a few of us could survive.

"Few escaped and fewer still managed to hold out for 50 hours in the stormy, oil-covered ocean. It happened on July 11 at 8:15 p. m. when we were forced down to a depth of 190 feet because of depth charge attacks from the enemy. Unfortunately, First Mate Holler was injured and had to be replaced by Second Lieutenant Shulz. He took the wheel and made a mistake in his calculations. He thought we were still 10 to 12 yards from a reef, when we actually hit it.

"Within two minutes the engine room and the tower were full of water and the boat listed 20 degrees. Eighteen comrades managed to escape the submarine, but 14 of them met death in the oil-covered sea.

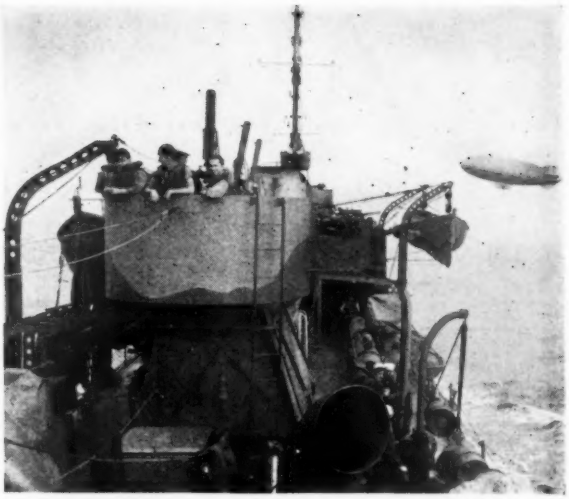
"One man could not swim and sank right away. Two went mad and in their delirium took off their inflated jackets because they thought they saw land. Those others who kept struggling had just one lemon and cocoanut for food. Comrade Schwab opened the cocoanut under the greatest difficulties but a few seconds later he silently disappeared in the waves.

"I wish to add one word of special praise for our radio operator who at all times was most helpful, altruistic and heroic. It also was he who helped myself and three comrades in a rubber boat which had been dropped for us from an American airplane which spotted us. All our men assisted each other most gallantly to the last moment . . . "

The German language broadcast in which this letter was quoted was intended only for German ears. It came from Station Gustav Siegfried I, which is a German anti-Nazi station, conducted by the anti-Hitler element in the German military organization. The account then went on to point out that the German propaganda agency wished to fake this account, or to suppress it, in the belief that it would point out the shortcomings and hardships of the German submarine service.

The most interesting thing about this broadcast is the sub-

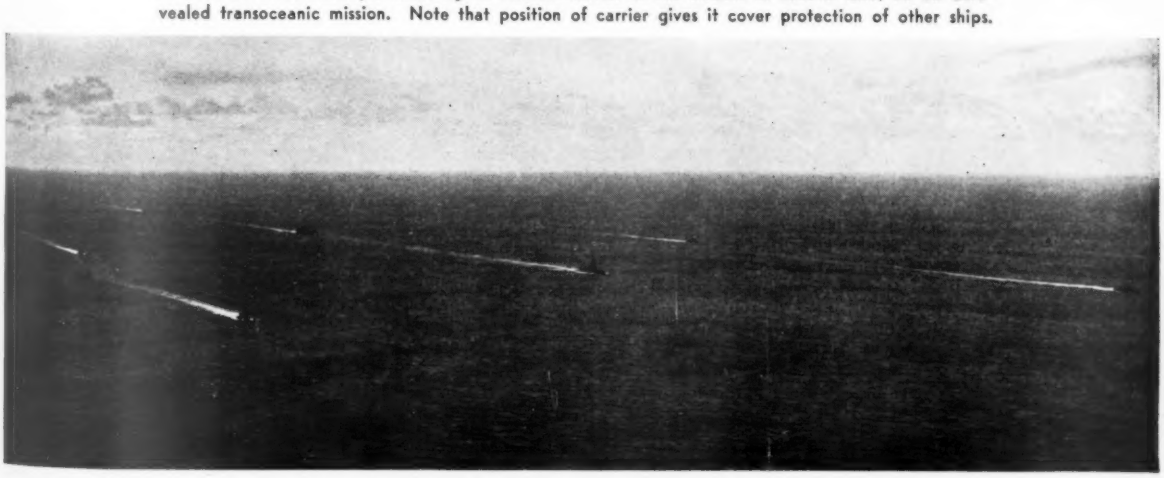
(*Continued on page* 226)



Navy blimp (upper right) co-operates in watching over a coastal convoy. Note machine gun nest (center). Torpedo tubes and depth charge projectors are at right.

Crew members of an American aircraft carrier, part of the huge African convoy, find space on flight deck for daily exercise. Planes are Douglas "Dauntless" (SBD's).

A force of U. S. warships, including an aircraft carrier in the middle of second lane, on an unrevealed transoceanic mission. Note that position of carrier gives it cover protection of other ships.



AIR HEROES

TO the average American the men on these pages are closely related to Superman. To the Navy they are just a few among thousands of fighting men, all of whom have performed equally daring and courageous deeds. These Naval and Marine airmen came from all walks of life to enter the service in which they distinguished themselves. Above all, they are typical Americans.

For helping destroy a Jap carrier, Lieuts. Walter A. Haas and Arthur J. Brassfield got Navy Crosses.

Veterans of the Battle of Midway are Ens. George Gay, sole survivor of Torpedo Squadron 8; and Lieut. E. S. McCuskey, who shot down 7 Japs.

Lieut. Clarence Dickinson fought at Pearl Harbor, Marshalls, Wake, Marcus and Midway, has Navy Cross and Air Medal. Now he's tactics instructor.

←

ARM/3c John Liska, rear gunner in a scout bomber, shot down three Zeros in Coral Sea. Total for his airplane in that battle was seven Jap Zeros.

Marines' dive bombing ace in the Solomons was Lieut. Col. Richard C. Mangrum. He is back in this country training new pilots.

Capt. Marion E. Carl is the Marine fighter ace who vied with Major Smith in rolling up their box scores. He shot down 16 Japs.

Until recently the leading Marine fighter pilot with 19 Japs downed, Maj. John L. Smith now is teaching combat tactics.

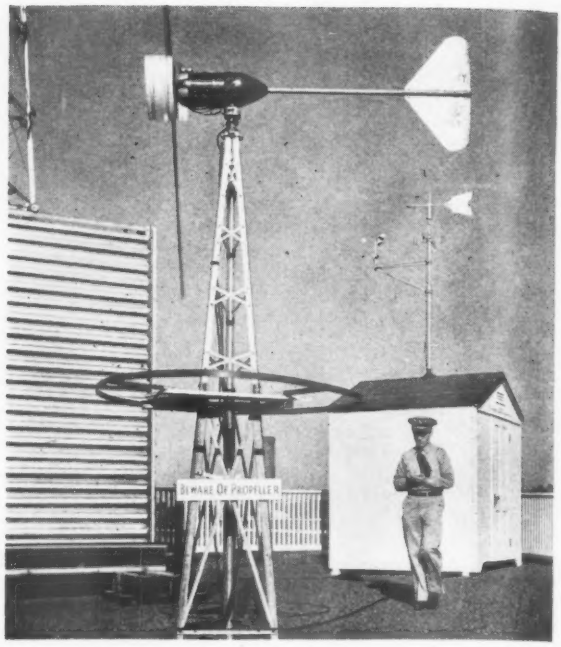
☆

Lieut. Comms. W. O. Burch, Jr. (left) and Joseph Taylor led dive bombing attacks against Jap carriers in the Battle of the Coral Sea. Their Douglas "Dauntlesses" dived from 18,000 feet and scored 14 hits on the Jap carrier "Shoho," sinking it.

Lieut. Comm. Paul H. Ramsey received a Navy Cross for air action against the Japs in Coral Sea. His ship was sunk. He was based aboard the "Yorktown."

Lieut. Noel Gayler, another veteran of Fighting Three, downed eight Japs, has won the equivalent of three Navy Crosses.

Automatic weather recording stations are widely used by the Navy, can be installed in remote places to record conditions.



Wind-driven generator supplies electric power for automatic weather-recording station. Propeller can generate six volts.

AEROLOGY

by Comm.
H. T. ORVILLE

Nearly all Naval aviation operations depend on the weather. Today Navy aerologists, some of the world's most expert weathermen, are doing much to help win the war.

Commander Orville is the aerological officer, flight division, Bureau of Aeronautics. He was graduated from the Naval Academy in 1925, then did extensive postgraduate work in aerology at the Academy, M.I.T., Lakehurst and Anacostia Naval Air stations. A Naval aviator (airships), he was an official observer on the first transatlantic flight of the dirigible "Hindenburg."

"Weather for the operations was perfect."
"Operations were curtailed due to bad weather."
"Contact was lost due to unfavorable weather."
"Clouds were used effectively."

THE above quotations, taken from official Navy communiqués, are typical of the references to weather in the daily reports of sea battles. No commander ever sits down to plan any kind of action without calling in the aerologist. "What are the weather and surf conditions for landing at point X?" he may ask, intending to land a dozen or so Marines and chase a Japanese regiment up in the mountains. Or, his question may be intended to lay the ground work for the greatest Naval armada in history—one, say, with several hundred merchant ships, 100,000 troops and many warships headed for the north coast of Africa to open a second front in the current war. As brought out clearly in the news, one of the most critical problems of our Morocco-Algerian campaign was that of landing big flat-bottomed boats through heavy ground swells. The best possible weather was vital to the success of the campaign. Navy aerologists went to work to find the most favorable weather and sea conditions for the greatest military landing in history. In the final planning, it was the aerologist who recommended the now historic date of November 8, 1942.

History is filled with decisive Naval engagements that were lost through high winds and heavy seas. In 1588, the Spanish Armada worked out a very sound scheme to advance up the English Channel and scatter the British fleet along the bottom, but unfortunately for the Spaniards, they neglected to take into account several important factors, not the least of which was the state of the weather. Aerology would have come in very handy to the Spaniards on that occasion.

The aerologist was practically unknown to the U. S. Fleet before the development of aviation. Now, with the Navy's planes taking a leading role in the fighting, his job has become indispensable. Weather calculations must be absolutely precise for successful plane operations. A ship can continue to function if caught in a severe storm, but often an airplane cannot. In the case of a bombing raid, for example, the air group commander will ask: "What kind of weather can we expect to and from the target and in the vicinity of the enemy's position?" The answer to this question will influence the time of take-off, the kind of bomb load that can be carried, and will indicate the location of the target to be bombed. Favorable winds for the mission will reduce the amount of gasoline reserve required and permit taking heavier bombs. Conditions may be favorable over one target and unfavorable over another nearby.

In planning a hit-and-run raid the task force commander is interested chiefly in having thick weather which will give

Aerologists aboard a carrier send up a hydrogen-filled balloon to plot wind aloft. Balloon is checked with theodolite.

Aerological officers aboard a carrier check last-minute data with which to supply pilots before sending on battle mission.

maximum protection for the approach and retirement but will be clear enough for operations at the target. One of the toughest aerological problems so far in this war of extreme distances has been making forecasts for sea trips that have ranged up to two or three thousand miles. Such an operation requires a knowledge of weather conditions over an incredibly vast area as well as a knowledge of all the changes that might be expected during the trip. Our aerologists have accomplished these difficult tasks with success.

There is surprising variety in the duties of the aerologist. Back in the halcyon days before December 7, 1941, one of the most common questions likely to be asked him was, "Will the skipper's wife be able to have a garden party Sunday?" Navy weather men have done some excellent work on cases of this kind, there being often no fundamental difference between a garden party and a landing party. However, during the last few years of peace the aerologists were also busy developing the system for sea operations which is now being used in wartime. During the annual Fleet problems (maneuvers), a method of handling weather information to simulate war conditions was worked out and all of the aerologists were required to use it. It was decided that the aerological unit of the Fleet flagship would prepare complete weather data and be equipped to issue warnings at all times. The system, refined somewhat, is now in constant use in the Fleet. A few hours before war was officially declared on December 8, 1942, the Navy placed its wartime weather organization in operation. The chief of Naval operation, concurring with the U. S. Weather Bureau and the Army, sent the following message to the Fleets and to the various commandants: "Discontinue all plain language radio weather broadcasts."

In addition to the central procedure, a good many officers and men assigned to aerological duties are now frequently called upon to "fly" their own forecasts, or, in other words, to make first hand observations by accompanying pilots on operational flights. This is done to indoctrinate the weather men in all the different problems likely to be met by flyers. It has been found that actual flight experience is of inestimable value in improving forecasting technique.

The role of the aerologist has been compared to that of the medical officer. The doctor diagnoses the symptoms of his patient, prescribes treatment and advises on the likely outcome of the case. The aerologist feels the pulse of the weather, using all the instruments science has made available, and advises on what kind of weather he thinks is going to take place for a short time hence. Under certain conditions very accurate forecasts can be made for several days in advance. Sometimes, in particularly turbulent areas or unsettled seasons, an accurate prediction can be made for only a few hours ahead. Unfortunately, one of the most difficult areas for the aerologist is the southwest Pacific ocean. Weather has a habit of drifting from west to east, and the great distance between weather stations give the aerologist little inkling of what is cooking to the west of him. He has to make out the best he can with local observations of air pressure, temperature, wind velocity and evolution of the clouds.

Navy aerologists were especially preoccupied before the raids on the Marcus and Gilbert and Marshall Islands, the Battle of the Coral Sea, the Battle of Midway and the battles in the Aleutians and the Solomons. Pitting their experience and knowledge of weather behavior against the quick changes of the Pacific, they waged a highly successful struggle to enable Fleet and airplanes to be sent into battle under the best possible conditions. Just how successful they were in these actions may be explained by reiterating that most of our fights in the Pacific have been waged in weather favorable to us.

In the Atlantic the weather is more easily predicted, but it is unhappily true that much of it is bad. The only helpful aspect of this is that the weather, these days, is as rough on the enemy as it is on us. There is perhaps no more rugged type of ship afloat than the submarine. Life in a Nazi U-boat, on the prowl for convoys, must be very unpleasant. In the convoy phase of the war Navy aerologists have done valuable work. Time and again convoys, in some cases made up in part of ships not overly seaworthy, have been rerouted through less stormy lanes and probably saved from serious loss. Our weather centrals are scattered all over the globe, keeping a watchful eye on the precious cargoes of planes, men and materials being rushed to our allies. One skipper who neglected to avail himself of the aerologist's storm warning radioed in that he had made a mistake. He described the condition of the sea as "Number 9"—the highest number on the international scale of wind velocity—and added, "The tables don't go any higher, but the seas are." An outstanding example of the emergency work of the aerologist was a recent rescue of survivors of an Atlantic sinking. Belatedly receiving all the available information on the sinking, the aerologists went to work in a hurry. They took note of the weather, computed the rate and direction of the sea drift and got in touch with a patrol plane. "A life raft ought to be 150 miles southwest of the scene of the sinking at nine o'clock tomorrow morning," they said. The patrol plane flew to the spot indicated, picked up the survivors (all in good shape) and returned home.

The Fleet, with its aircraft carriers, battleships, destroyers, cruisers, torpedo boats and aircraft, is comparable to a football team, on which each member has a specific job to do. Perfect timing and co-ordination are required in order to win. Before a battle, the Navy aerologist is somewhat like a football scout who digs into the tactics which an opposing team is likely to use. The aerologist finds out what "Old Man Weather" is likely to be up to in the forthcoming engagement. Then, when the task force has made contact with the enemy, the aerologist's

Automatic radio meteorograph transmits weather by radio.

role changes—he becomes, as it were, a water boy, keeping the Fleet constantly supplied with information on things like squall areas and cloud conditions. Sometimes the information will be used to help us find the enemy; again, it may be wanted so that our Fleet can find temporary respite to patch up its wounds.

Navy aerologists pay high tribute to the U. S. Weather Bureau, to the Army weather men and to similar organizations of the United Nations. Without the closest co-operation among these units it would be impossible for any one to function with complete efficiency. All of them swap information from advance bases and reports from ships whenever radio silence makes it feasible. The aerologists of the Allies are hard at work all over the world.

Not many people know that the "Flying Tigers," or American Volunteer Group, in China had as an essential part of their personnel three Navy aerographers' mates and two Army weather observers who obtained discharges from their respective services to join up. The work they did for the AVG's

Transmitting weather information overland by teletype.

was so interesting and varied that I would like to quote here at some length from a remarkable report sent in from Donald A. Whelpley, one of the three Navy men. Since the disbanding of the "Flying Tigers," Whelpley has re-enlisted in the Navy as an aerographers' mate, first class.

"In July, 1941" (the report reads), "word went around the Naval Air Stations at Norfolk that a Mr. Irvine, ex-commander in the Navy, had set up a little office in one of the hangars and was taking applications for a combat group to protect the Burma Road. He was taking a small number of practically every aviation rating, including pilots. As for aerographers, five rated men were needed who had completed the aerographers' school course. He got *only* three—myself, A. W. Fritzke and R. S. Richardson.

"We were given a sheaf of forms to fill out, the gist of the thing being that we were applying for employment with one 'Central Aircraft Manufacturing Company of New York'. The company's contract stated that 'among other things' they operated an aircraft factory in China. About a week after the forms were filled out orders came from Washington to issue special discharges to us three aerogs. We were to report (at the company's expense) on August 18. During the last week in August our group of 38 men left the U. S. as first class passengers aboard a cruise ship. In October we arrived for our training at Toungoo, Burma.

"It was at this point that the AVG was formed. We had about 300 men there, the aerological complement being five men—three from the Navy and two from the Army. We tried to set up an ideal weather net and office but found that equipment was nil. One sling psychrometer was all we had. During October and November we did our best by local observation and forecasting. This was satisfactory, as Burma is tropical and has no synoptic weather. In October the rainy season was just coming to an end, so it was most important to be on the lookout for sudden thunderstorms and rain squalls. During November, flying conditions remained excellent, what with the northerly monsoons from the nearby Himalayas. The weather gang was slightly superfluous then, so we chose our own jobs in other departments — control tower operators, clerical work in the office and radio work. While this wasn't exactly what we'd been hired to do, it did afford good experience in things indirectly connected with weather.

"In early December the group was considered ready for action against the enemy. Richardson had gone up the Burma Road to drive trucks into China and had been exchanging weather reports with the Toungoo station by radio. Fritzke was attached to Squadron Two of the AVG and went to Rangoon when it was learned that war was declared and that the Burma Road would likely be attacked. There he also worked with the RAF and British meteorolists furnishing weather information for the squadron. The Japs first raided his base on December 23. After this all formality was dropped. Fritzke supplemented his weather work by becoming an armorer, or ordnanceman, helping keep the few P-40's in the air. The tempo of the Jap bombings and strafings of Rangoon increased until it was almost a continuous attack. Evidently they were going to take that stronghold at all costs. In that campaign alone they lost over 300 planes to the AVG, as against 20 we lost.

"I was in Rangoon as general handy man at various times during January and February. We dared not sleep on the field but in the ditches and trucks a few miles out. Even these locations had to be changed every night, as Burmese fifth columnists lit fires in our vicinity whenever the Japs came over. They were always one night behind us, however. The group pulled out of Rangoon a few days before it was captured and a day or so after the inmates of the insane asylum, leper colony, and penitentiary had been turned loose. We moved to several more bases in Burma and stayed until bombed and chased out by the Jap armies.

"While all this was going on in Burma, we had organized a fairly good weather net in China, around our main base. Here there was a nuisance bombing once a week or so, but our warning system was good and the planes seldom got to their objective. The AVG had a main radio station and outlying stations covering an area of several hundred miles. Attached to each station was a Chinese weather gang under our supervision. They didn't have much equipment—what

(*Continued on page* 288)

Salon Section

U. S. Naval aviation in action is dramatized in the outstanding photographs that follow. The photographers, among the world's best, are Navy officers.

(For Background Data see page 276)

COLOR GUARD

LOOKING FOR TROUBLE

LEATHERNECK

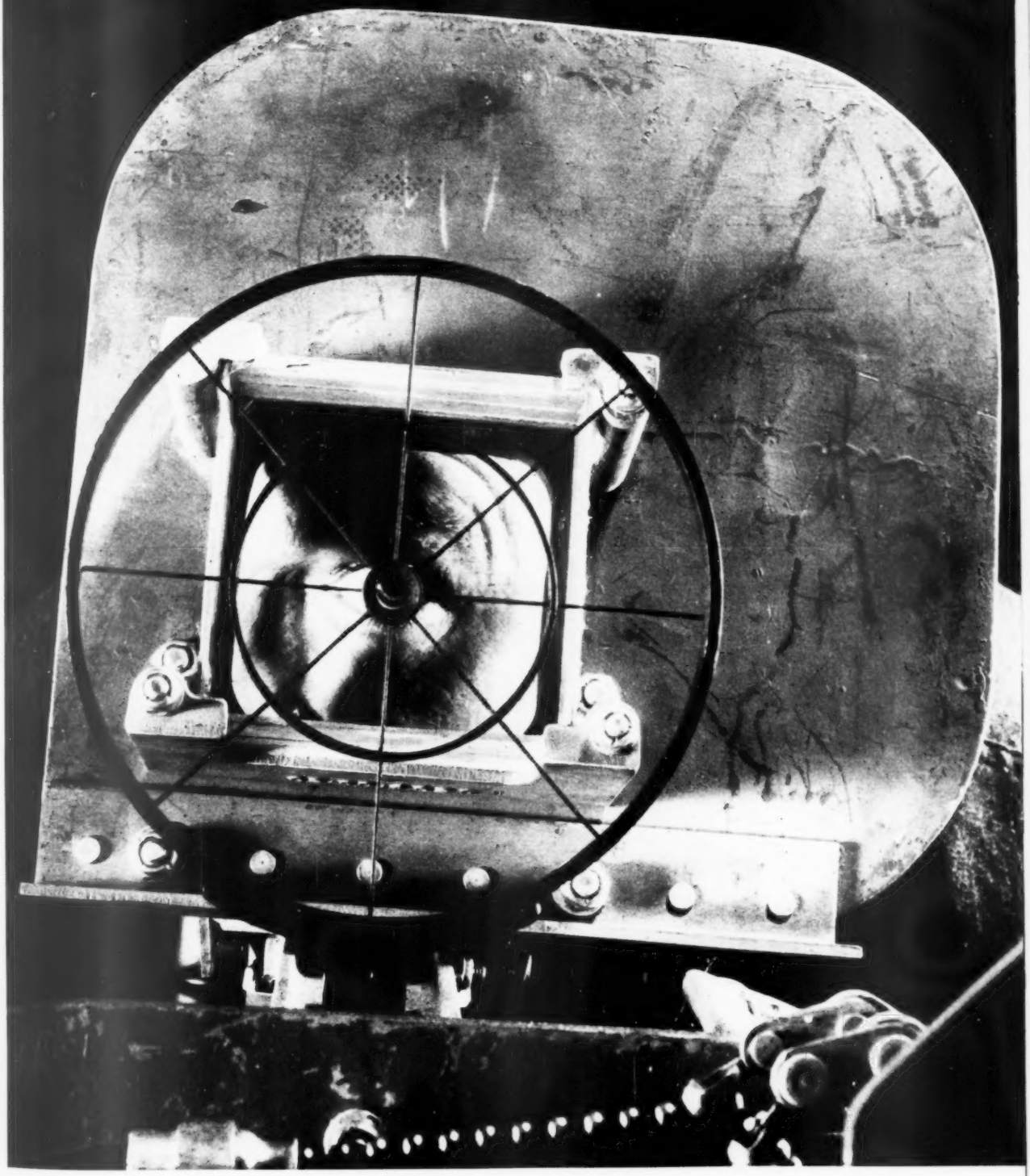
RAMP CLEAR

RAMP CLEAR
AT ANCHOR

GOOD HUNTING

GOOD HUNTING
VSB
WHAT'S COOKING?

CRAFTSMAN

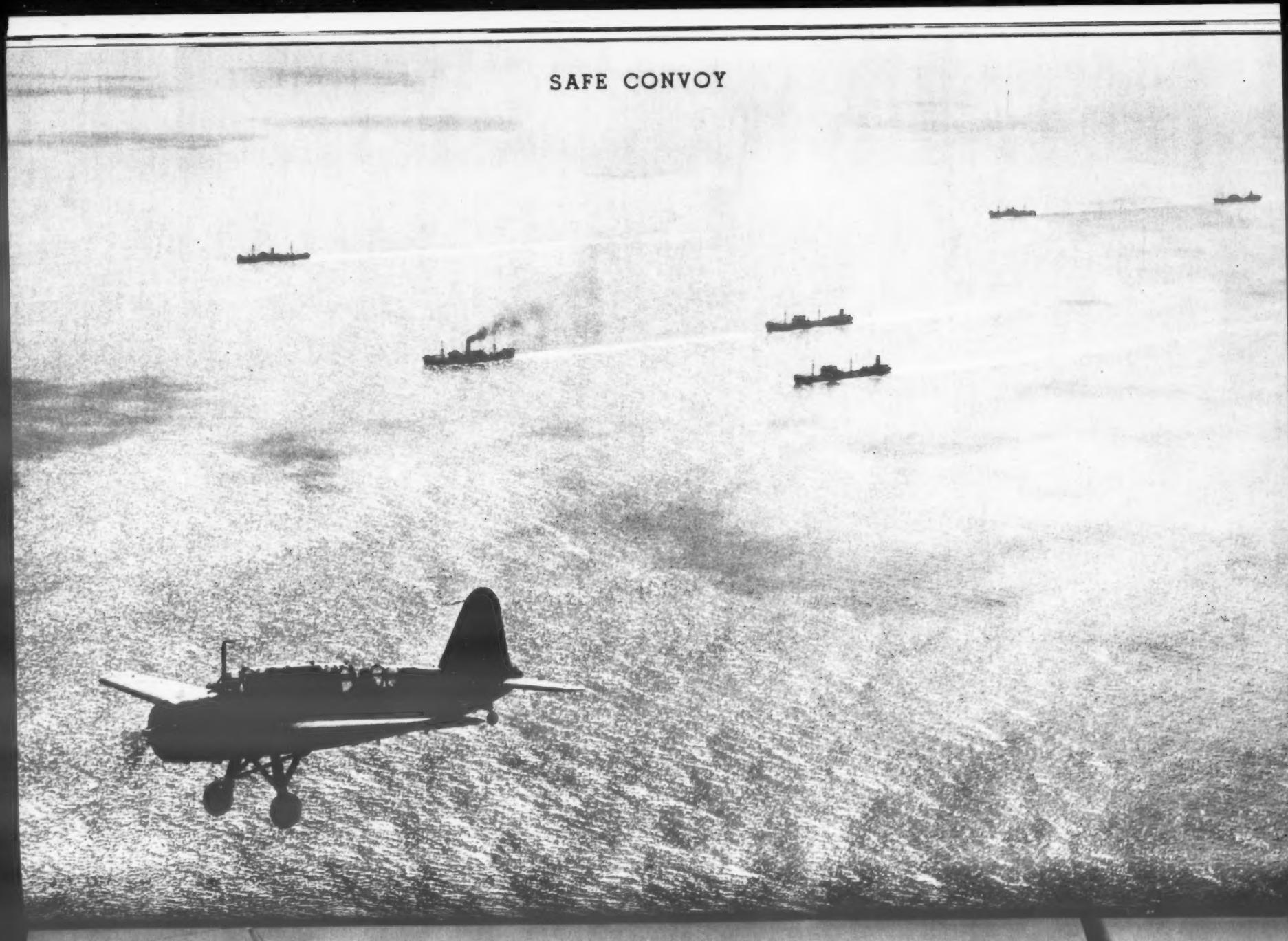


GUNSIGHT

HANGAR FLYING

THE TOWER

SAFE CONVOY



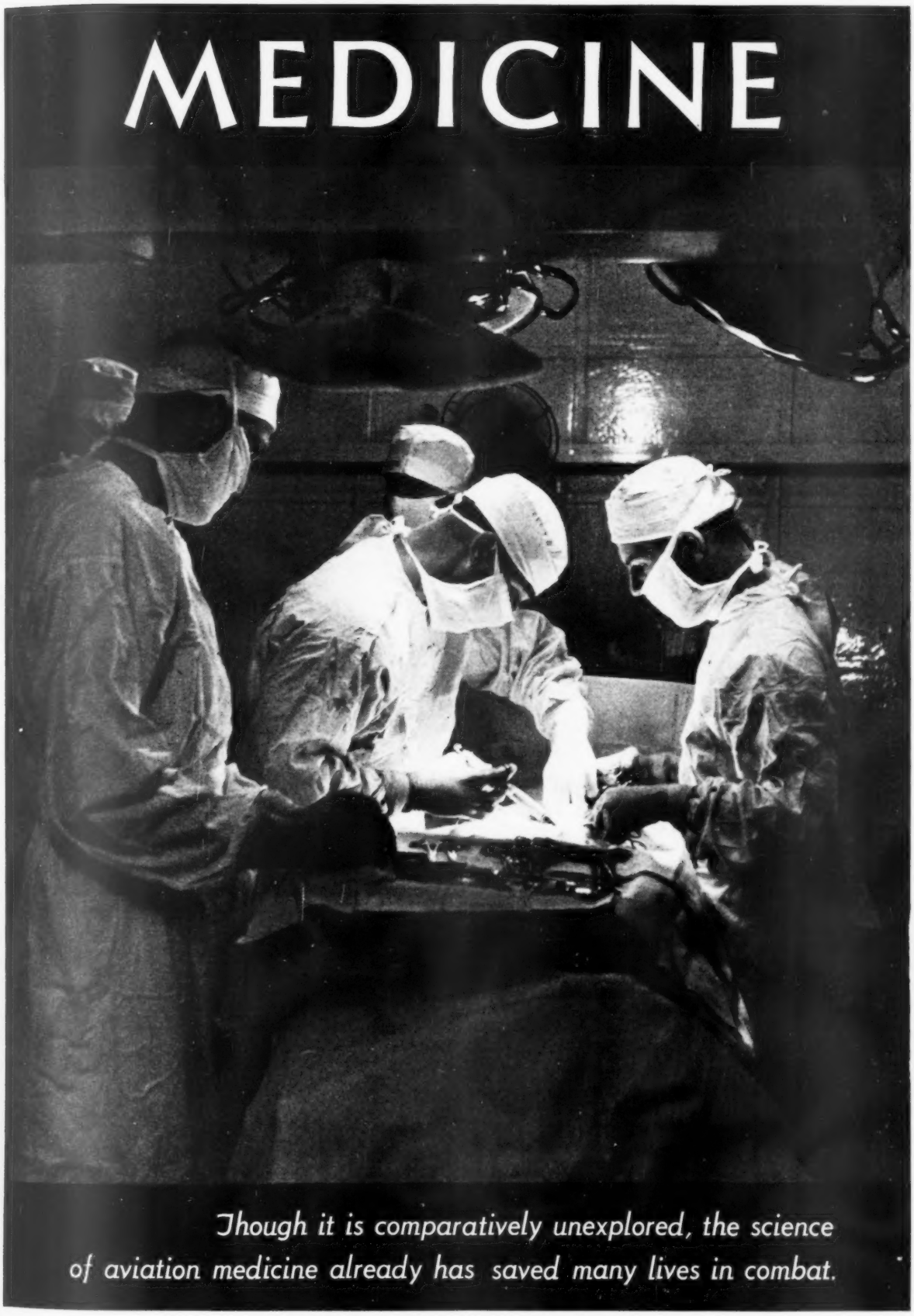
TIN FISHERMAN
15
LP-13

FIGHTER

DIVE BOMBER

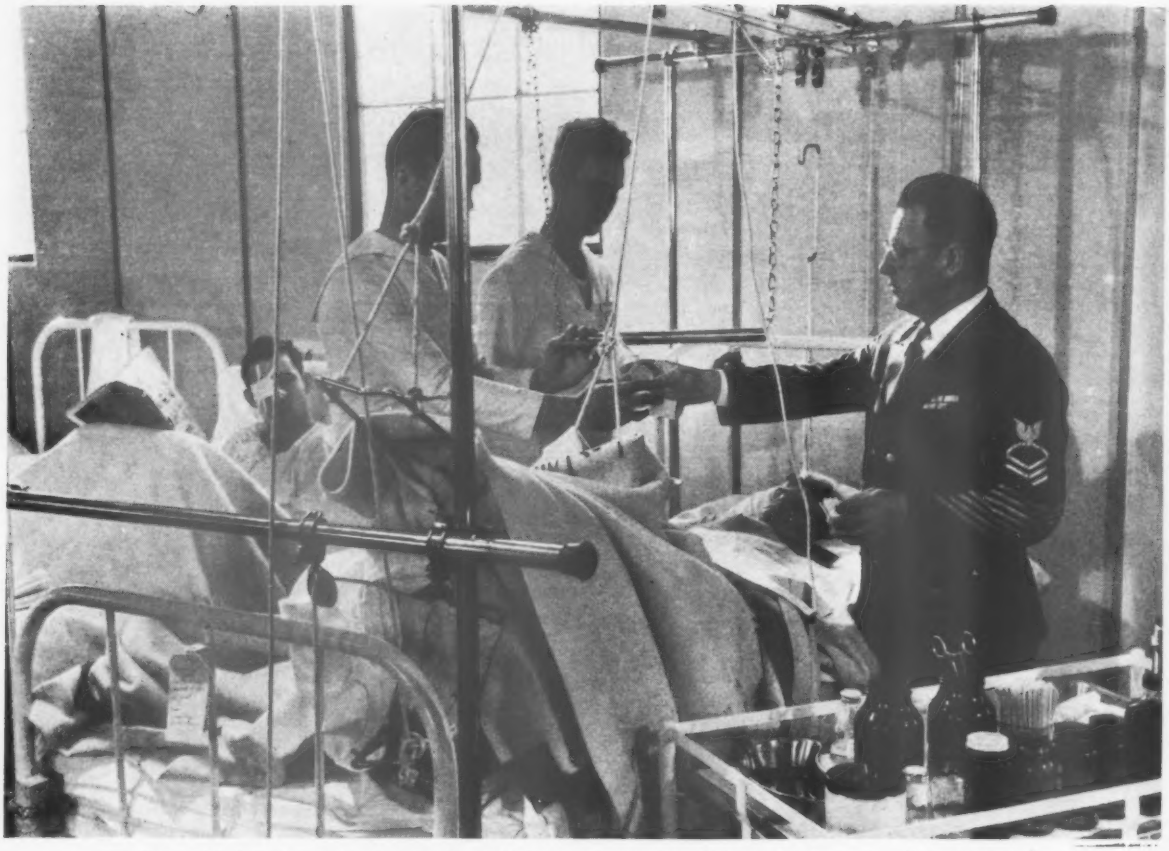
AVENGERS

MEDICINE



Though it is comparatively unexplored, the science of aviation medicine already has saved many lives in combat.

U. S. Navy surgeons perform an operation aboard a carrier.



This mobile base hospital unit at Auckland, N. Z., was in operation 30 days after its construction was started.

MEDICINE

by Comm.
L. D. CARSON

Commander Carson, head of the Medical Research Section of the Flight Division, Bureau of Aeronautics, has been a Navy flight surgeon for 15 years. He has served on the carriers "Langley," "Lexington" and "Saratoga" as well as at aviation shore stations. He graduated from the University of Minnesota and Northwestern Medical School, entering Naval medical service in 1924.

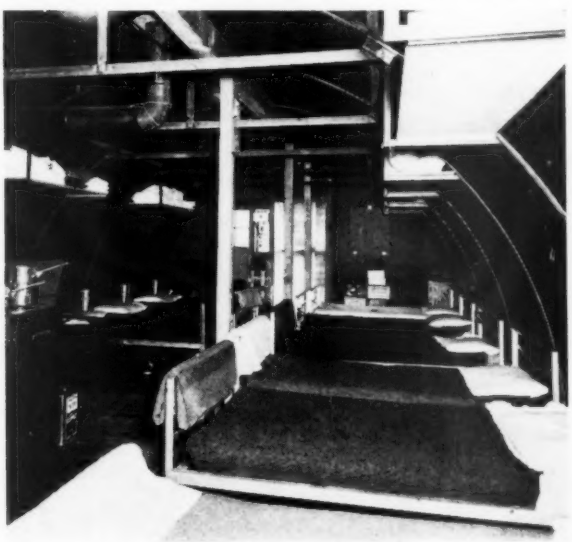
IN THIS global war we are now fighting, the climatic, geographical and environmental factors which affect the health and fighting efficiency of our combat forces now are the principal concern of all medical officers of our rapidly developing military branches.

The climatic conditions which we must meet and overcome are amazingly varied. Naval forces are in contact with the enemy from Alaska in the Arctic circle to the southern tip of the African continent, including the equatorial jungles and deserts of New Zealand, Equatorial Africa and Egypt. Our forces must be trained, physically conditioned and provided with suitable protection for fighting in every conceivable adversity of climatic condition. These range from the perpetual rains and freezing blasts of the Aleutians to the steaming disease infested jungles of the "hump of Africa" and the blazing desert of Egypt with its sand and dust storms.

Geographical problems include the bitterly cold and treeless tundras of the Aleutians where the only possible means of advance are by way of turbulent seas and skyways, the equally impenetrable jungles of tropical islands and continents, and the heat of the Egyptian and Australian deserts.

Common hardships are those of extreme temperatures and humidity ranges, unavoidable exposure to malaria, yellow fever, plague, and other diseases of the tropics, and to the withering heat, dryness and dustiness of desert areas. In addition there are certain hazards naturally encountered in the use of the tools with which we are fighting this war—the aircraft, the aircraft carrier, the submarine, the fighting ships, the incredibly fast, light, shallow draft torpedo boat; the tanks and motorized vehicles. It is the problem of the flight surgeon to "Keep 'em flying"; of the Naval medical officer to "Keep as many men at as many guns as possible"; and of the medical officer with Marine Corps or Army motorized divisions to have men fit to "Keep 'em rolling." This is a broad picture of the problems which the modern military surgeon must face. He is facing these problems and solving them

Interior end view of a prefabricated first aid station. Note operating table and stretchers at right. Below is a side view of the same building. Radio visible in rear is for entertainment of patients. Stove at left makes possible the serving of coffee, a ritual with our Navy men, regardless of the hour. Despite apparent security of scene, sandbags protect structure.



His duties indicated by the red cross on his helmet, medical aide aboard carrier keeps close watch for need of his service.

Navy medical men have achieved such a high degree of skill that, in treating combat casualties, they expect to return a third to active duty in a few days, lose only one third.

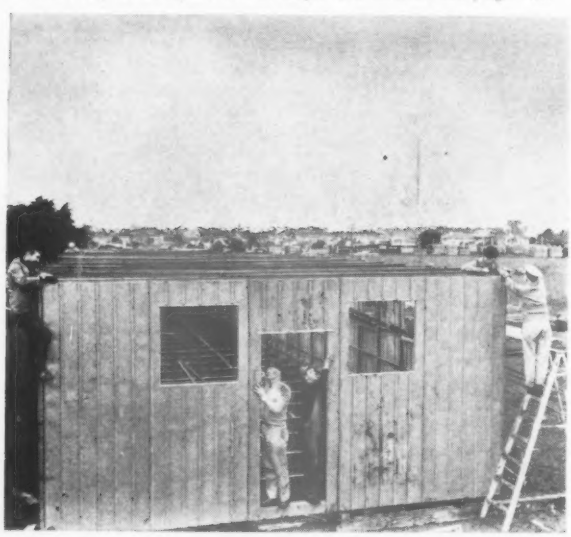
In addition to complete medical and surgical equipment, the U.S.S. "Charger," a new Navy carrier converted from a merchantman, includes an elaborate well-stocked drug dispensary.

quietly and efficiently with every facility which medical, physiological and psychological research can offer.

From the standpoint of the military surgeon, wars are fought effectively only when the number of combat casualties greatly exceeds casualties due to disease and occupational stresses which are preventable. There never has been a major war in which casualties due to disease and illness have not greatly exceeded combat casualties. Preventive medicine, plus recently developed medical and surgical techniques for combating shock, severe hemorrhage and infection (use of chemo therapy), offer us some promise of reversing the picture. Medical logistics now estimate that even in dealing with combat casualties, it should be possible to return one-third of them to duty within a few days, another third within one to three months, and only one-third will be lost as fighters.

In spite of the popular acclaim of such modern miracles as the restoration to health of severely injured men by blood plasma and preserved blood transfusions and by the use of the sulfa drugs to combat infection, preventive medicine still occupies the position of first importance in maintenance of total fighting effectives. And by preventive medicine, as practiced in the military services, we must consider not only the various inoculations and vaccinations for immunity against contagious or infectious disease such as typhoid, malaria, yellow fever, plague and tetanus, although these are of tremendous importance. Other branches of military preventive medicine are playing an increasingly important role. Some of these are: aviation medicine and hygiene, submarine medicine and hygiene, and preventive medicine as applied to the problems of chemical warfare. Each of these specialties has contributed much to the development and maintenance of the physical fitness and effectiveness of fighting personnel. Of these groups, aviation medicine has contributed most actively to the protection of military personnel against unusual environmental and occupational hazards.

This Navy hospital being erected at an overseas base is made of prefabricated materials. The entire structure was completed and ready for occupation in 30 days. For interior, see page 160.



The rapid development of the airplane as an instrument of warfare has made it the most destructive weapon yet evolved by inventive and scientific genius of "civilized" man. To make it a superior weapon as fighter or bomber, it must have tremendous power, speed, range, altitude "ceiling" and strength to withstand forces engendered by high maneuverability. In other words, the aircraft can "take it"; the man who flies it cannot. Let's consider what modern aircraft performance can accomplish.

First, it can climb rapidly to extreme altitudes. It does this because of improved wing design and power-weight ratio, but principally because of supercharging or "pressurizing" of the air entering the carburetor or injector. Engine design has had to solve many problems affecting engine and plane performance because of altitude—low barometric pressures and low temperatures. Studies conducted by flight surgeons and their colleagues have attempted to accomplish the same adaptations in the human being, but the difficulties are many because it has not been possible to redesign the man. Much has been done, however, to enable him to tolerate his new unfavorable environment.

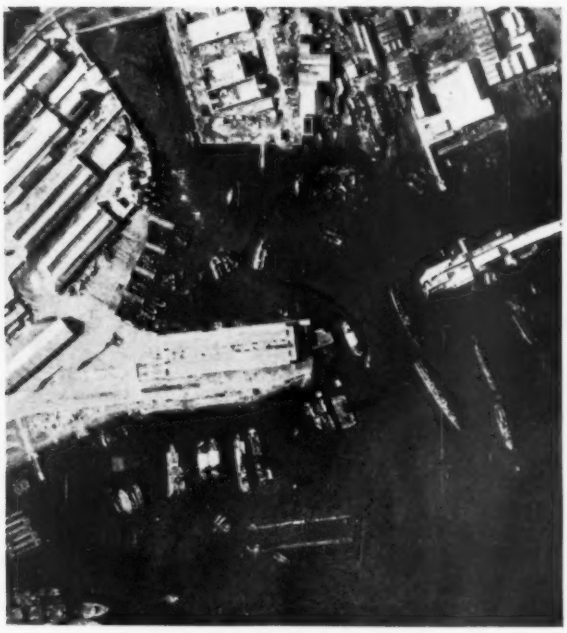
The problems of anoxia due to lowered partial pressure of oxygen in the air has been met by development of oxygen supply systems and masks which supply added oxygen in such percentage as to meet the physiological needs.

The second physiological problem of altitude is also directly due to lowered barometric pressure. Somewhere above 18,000 feet, gases (mainly nitrogen) which remain in solution in blood and tissues under terrestrial pressures begin to volatilize and release themselves in the form of air bubbles which continue to coalesce and to expand until they cause the much discussed phenomenon of aeroembolism or "bends". This

(*Continued on page* 232)

AIR INTELLIGENCE

Stereoscopic apparatus is used in study of reconnaissance photos.



Intelligence photograph of Casablanca harbor during attack.

Air Combat Intelligence is a new phase of informational work. It is charged with the task of gathering and disseminating all battle data.

by Comm.
FRANK W. WEAD

Commander Wead was born in Peoria, Ill., 1895, and graduated from the Naval Academy in 1916. He has seen a wide variety of sea duty, including service as commanding officer of the U.S.S. "Langley." In 1923-24 he commanded the Navy's Schneider Cup team. A leading aviation writer, he now is writing a screen version of the saga of Bataan and Corregidor, "They Were Expendable."

TO THE layman, war time intelligence smacks of Mata Hari, secret agents, stolen battle plans, cryptography, information gleaned from prisoners and from observation of enemy forces in the field. Those spectacular phases play a part, but intelligence work is primarily a business—the business of gathering and disseminating information. In this Second World War, air power has for the first time become a vital military and naval factor over land and sea. Its growth has brought into being a new phase of informational work, the U. S. Navy term for which is Air Combat Intelligence.

Air Combat Intelligence primarily concerns itself with operational information—objectives, targets, enemy ships, aircraft and areas, the results of air action and so on. In many respects, particularly in the briefing and interrogation of pilots, it is similar to the air intelligence functions of the RAF and the U.S. Army Air Forces.

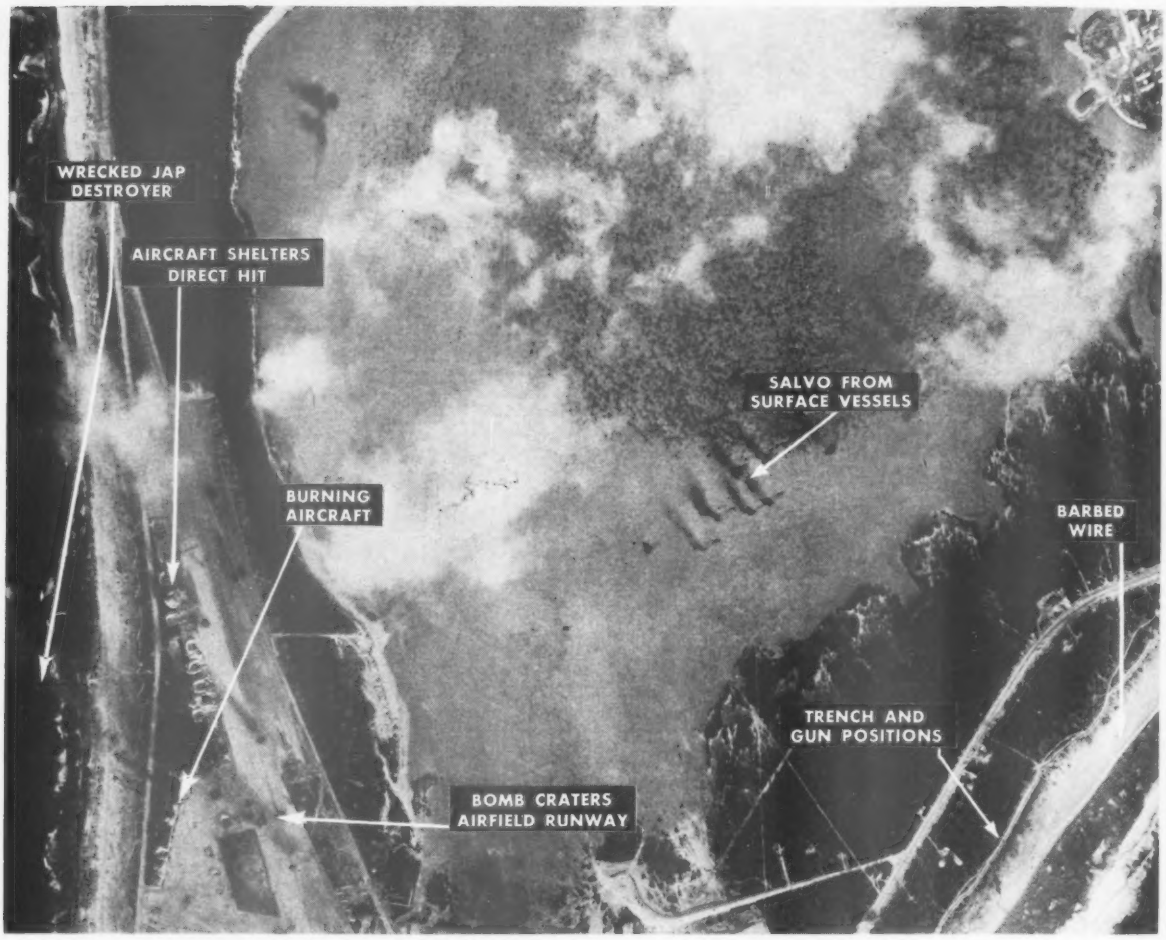
"Briefing" means the instruction or checking of pilots prior to any operation, to insure that they have all necessary data pertaining thereto. "Interrogation" means the questioning of pilots after such operations, to ascertain the results thereof.

Briefing covers target information, bomb and armament loads, courses, wind, weather, altitude, method of approach and attack, and formations to be flown. Personnel are usually briefed in groups. Pertinent items are handled by the squadron or flight leader, gunnery officer, aerologist and engineering officer. Other items are handled by the Air Combat Intelligence officer, who may use a briefing form to insure that no vital point is overlooked.

Interrogation concerns itself with the results of the mission, enemy ships or targets bombed, torpedoed or strafed, enemy planes damaged or shot down, damage to or loss of own aircraft, altitude, direction and circumstances of the attack, weather encountered, ammunition expended, own tactics employed, enemy tactics encountered, material and training defects which should be corrected. Pilots and flight crews may be interrogated in small groups, such as a section or division, or singly. The intelligence officer makes notes, usually following an interrogation form. From these notes and forms the smooth report of the action is prepared. Pilots and flight crews invariably bring back conflicting stories of any air action. The very nature of such engagements is confusing; no one pilot or flight crew can see the entire picture; the assembly of these different stories and bits of information into a complete mosaic is the function of the Air Combat Intelligence officer.

In interrogating pilots, often tense and emotionally upset after an action in which close friends have lost their lives, the Air Combat Intelligence officer needs a highly sensitive and deep understanding of the flight crews he works with. He should have their liking and friendship. He should know when to press for answers, when to let them go until a more favorable time. A tired pilot is very apt to tell an overzealous or undiplomatic ACIO to go to hell. Such information is not of great value.

ACIO's must be walking encyclopedias of all information available on the area in which they are operating. Other duties of the Air Combat Intelligence officer involve recognition of ships and aircraft, the maintenance of intelligence ma-



An aerial reconnaissance photograph of Japanese-occupied Wake Island under attack by planes and ships of U.S. Navy. Points of importance were noted in Air Intelligence interpretation of battle's progress.

terial and files, charts, maps and all other data available on the area. Such material is usually prepared in condensed handy form for the flight crews. He may keep up a situation map of the area. Target maps often have to be drawn. He must work closely with specialists trained in photographic interpretation, prisoner interrogation and the analysis of captured enemy material. He may often assist the commanding officer in preparing smooth reports of an action.

In some Naval squadrons ACIO's are assigned additional duties as communications officers. In the sea frontiers and at patrol stations they may, in addition to briefing and interrogating pilots, stand operational watches, insuring a flow of the latest information from the intelligence or information center to the operating unit.

As an example of how their duties are performed at sea, take an aircraft carrier, with one ship's ACIO and four squadron ACIO's. In one case, prior to sailing for a theater of war, these five officers functioned as a group, gathering and collating every scrap of information available on the area. Enroute, this data was analyzed, condensed and prepared on photostated cards for the handy use of pilots. Upon arrival in the theater, orders for an impending operation were received. The ACIO's assisted in preparing target charts and operating schedules. During the operation, which was against short objectives, squadron ACIO's handled briefing and interrogation of pilots. The interrogation results were taken at once to the ship's ACIO on the bridge, where, on a large chart, a running picture of the action with notes and tables was maintained. In this way the carrier skipper had before him a constant visual picture of the action of his aircraft, though their objectives were a hundred miles away. Over 50 missions were smoothly kept track of, without confusion. The final report of the day's work was easily prepared from the running record. It was a model of conciseness and accuracy.

Air Combat Intelligence officers are selected from the best qualified graduates of the A-V(S) Indoctrination School at the Naval Air Station, Quonset Point, R. I., where they have received an intensive two months' course on general Naval matters. They are then given an additional two-months' course in the Air Combat Intelligence Officers' School, also at Quonset. The ACIO course covers technical instruction in aviation material, recognition of ships and aircraft, the briefing and interrogation of pilots, the theaters of war, general intelligence matters, anti-submarine methods and other subjects which will enable these officers to perform their duties in the field.

Present quotas call for the assignment of ACIO's to all carrier and patrol squadrons, all staffs and ships of the Naval aeronautical organization, air stations, including LTA and Coast Guard stations, sea frontiers, Marine Corps units and Fleet Intelligence Centers.

ACIO's will assist in maintaining a constant flow of reports to the Navy Department of our material defects and desires, of methods developed which should be passed on at once to our training program, of the latest information on enemy tactics, material, and methods for dissemination throughout the service. The ACIO is a vital link between information and those units which must have it in order to do their jobs in service against the enemy.

END

RADIO AND FLEET AVIATION

Mastery of electric waves has proved a vital factor in making the airplane a powerful striking force in modern combat.

by Comm.
FRANK AKERS

Commander Akers, born in Nashville, Tenn., March 28, 1901, was graduated from the Naval Academy in 1922. After Fleet service, he completed flight training at Pensacola in 1925, then served in various air units. He had a three-year tour of duty under post-graduate instruction in communication engineering. He holds the DFC, and a commendation for extraordinary achievement.

An important member of Navy bomber crew is the radio operator.

DURING the battle of Midway a squadron of dive bombers was attacking an enemy force. There were two occupants of these planes: the pilot and the radioman, or aircraft radioman as he is designated. He is the man who handles all communications and mans the free machine guns as well. He must protect the tail of the plane against enemy fighters. This attack was taking place late in the evening and, as the pilot maneuvered into position for his dive, the radioman called frantically over the interphone circuit. The following conversation ensued:

Radioman: "That's one of our cruisers. Don't bomb her."

Pilot: "She's an enemy—why do you think she's a friend?"

Radioman: "She's friendly—she is signaling us frantically with every searchlight she has from bow to stern. I haven't been able to read her signals yet."

Pilot: "You poor devil—that's her antiaircraft shooting at us! Here we go!"

The pilot proceeded to lay his egg accurately. It was the first action for the radioman, but there would be many to follow and we may be sure that he will be able to distinguish between antiaircraft fire and searchlight signals in the future. There are many anecdotes connected with radio and with aircraft radiomen—some true and some doubtful. There is one which went the rounds after Midway, but is not verified.

During an attack on an enemy force the Japs apparently were listening on our voice circuit. After hearing "Stan" give an order to "Bill", they attempted the following deception:

"Bill from Stan—return to base." No one was fooled. If for no other reason the enemy accent was easily recognizable and the reputed answer was:

"Shut up, monkey, and come on up here and fight!"

In the radio logs of our aircraft carriers there are strange and lurid transmissions that some day will make good reading.

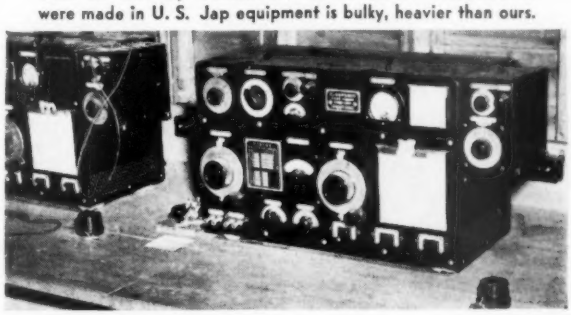
One story which has always produced a laugh covers a happening many years ago during peacetime operations. It was on a training cruise and the aircraft were operating at a distance from their carrier. Some water had found its way into the gasoline supply. A section of three planes was flying along when the section leader noticed one of his planes pull out and head down for a forced landing on the water. Clear and calm-voiced came the radio report from the section leader back to his carrier. "My Number Three man is having a forced landing." A short time later the second plane headed down. Again came the calm unruffled radio from the section leader. "My Number Two man is making a forced landing on the water." For a few seconds all was quiet, but then the radio sprang into action, and a highly excited high pitched voice yelled out:

"Hell's bells, here *I* go!"

Then there is the story of the pilot who whispered into the microphone during radio silence so that the enemy would not hear him.

In the war in the Pacific, Naval aviation is taking the lead and bearing the brunt of the fighting. Our Naval aircraft have taken the war to the enemy, and as the conflict continues, their role will become even greater. In the battle of Midway we saw the first great Naval air battle in which opposing task forces of aircraft carriers were locked in deadly combat. We saw it end in victory and a complete rout of the Japanese force. To accept this role, our Naval aviation must have the best possible aircraft and equipment. The airplane without proper equipment is of little value. It must have guns, bombs, radio, navigational equipment and many other items which make up the modern fighting machine. Of these, radio is a most important item. Without efficient radio and its allied developments, the airplane cannot promptly report what it sees; its orders cannot be changed; it is denied valuable navigational aids; and it cannot be properly directed in battle. Thus, no matter how well the plane is designed, nor how good its performance, our forces are severely handicapped unless their planes are properly equipped with radio.

Dials on this Jap transmitter, abandoned on Guadalcanal, were made in U. S. Jap equipment is bulky, heavier than ours.



Aviation cadets at Pensacola, Fla., practice code reception. All Naval aviators must have a thorough knowledge of radio.

A loop directional finder set up on ground for inspection and overhaul. Radiomen must know details of its intricate hook-up.

To utilize this radio equipment with intelligence, we must provide trained personnel, which is a mounting problem with our rapidly expanding Naval air arm. These men must know not only radio but must be expert free machine gunners. They are a part of the combat crew of the plane in which each person has a co-ordinated job to do, the proper performance of which makes the plane a deadly offensive weapon.

The importance of radio in Fleet aircraft has progressed steadily with the growth of aviation and the increased range of our airplane activity. Now, with the war, it is a formidable weapon besides being an important safety feature.

Aircraft without radio are badly crippled. The information on the enemy obtained by a flight of planes must be promptly transmitted to the officer in tactical command if it is to be of value. It is readily evident that accurate information promptly transmitted may be the deciding factor in any operation and may far outweigh in real value the damage that the particular flight of planes could possibly do with bombs or other methods of attack. Time and time again we see a numerically inferior force come away with a smashing victory. Often this is attributed, and correctly so, to the element of surprise—but this surprise could not have been possible without accurate and continuous information on the enemy. This information generally must go through by radio.

Very seldom do we hear these days of a "land action" or a "sea action." It is always "land *and* air" action or "sea *and* air." Often it is land, sea *and* air action. With such forces there must be great co-ordination for the operation to be successful. For this co-ordination we must depend upon our radio. This is especially true in respect to Fleet aircraft.

The designer of aircraft radio is faced with the problem of providing the proper facilities in a limited space with minimum weight, and often he must utilize antennas not of the best design but controlled by airplane structural limitations. This is an ever developing problem. New designs of radio must keep pace with new designs of aircraft and the various needs which war operations bring out. As the range of Fleet aircraft from their ships and bases increases so must the range of the plane's radio, but the weight increase must be kept at a minimum.

Airplanes must be provided not only with facilities for communicating back to their parent ship or base but to other airplanes and to the other forces which will co-operate in the campaign.

In addition, other features of radio development are given to the planes to increase their effectiveness in war operations. These include radio aids to navigation such as the radio direction finder. We are all familiar with the radio range beacon, the device which really made scheduled commercial airline operations a reality. Our Fleet aircraft must be so provided to utilize these and other facilities when they are available. Thus we have radio not only serving its original function of providing rapid communication, but, by its application, providing many safety and navigational aids, and in some cases even offensive aids in the operation of our Fleet aircraft.

Once the equipment has been properly designed and furnished to the service, intelligent use of it must be made certain through training of the pilots and aircraft radiomen. They must know when to use their facilities and when to obey rigidly "radio silence." Often the success of a mission may be jeopardized by breaking the radio silence, just as it may be jeopardized by improperly observing this silence and failing to report vital information. That is the decision which the pilot must make after carefully weighing the question and deciding whether to open up or keep silent.

Many years ago, during a maneuver in which the Fleet was divided into two parts for simulated action, one carrier group quickly devised a simple code for use by their pilots on the voice radio. In this code, "Johnny ate" meant "I have sighted" and "Cocoanut" meant "Submarine." During the exercise one of the pilots on patrol excitedly shouted over his radio:

"Johnny ate a cocoanut!" But on closer examination he determined that his submarine was after all only a whale. Now this quickly devised code gave no means of cancellation or changing of a previous message, but the lad thought fast and came through with another message—

"Johnny didn't eat a cocoanut. He ate a whale!"

We see that Fleet aircraft must be furnished not only with the best design of radio equipment but the pilots and aircraft radiomen must be ready for intelligent use of this vital equipment.

Imagine, if you will, the thrill which our carrier in the Coral Sea Battle experienced when the radio loud speaker broadcast the message from one of her pilots, "Scratch one flat-top," meaning one less Japanese carrier to worry about.

Radio is one vital link in the chain which, together with other installations, makes the airplane the powerful striking force it has become in this war.

END

Catapults permit warships, such as the "North Carolina" (above), to launch their aircraft practically at will.

THE CATAPULT

by Comm.
J. A. HALEY

Commander Haley, born in Fall River, Mass., in 1904, graduated from the Naval Academy in 1927. He took the torpedo course at Newport, R. I., won his wings at Pensacola, completed two years of post-graduate work at Annapolis and received an M.S. degree in aeronautical engineering at the University of Michigan. In June, 1940, he reported for duty in the BuAero.

The perfection of catapult apparatus has made possible the use of aircraft aboard the U. S. Navy's largest "battle wagons."

Catapult accelerates plane from zero to 70 m.p.h. within 60 feet. Head rest absorbs shock, saves pilot from neck injury.

THE first catapult officially employed for war purposes is reputed to have been brought out by Dionysius, a King of Syracuse, in the year 399 B.C. During the ensuing years and up to the advent of gun powder, the development of the catapult was based upon the idea of building a "bigger and better" machine than one's potential enemies. The most powerful weapon of this class could propel a 300-pound missile about a quarter of a mile. History also records, somewhat inexplicably, the heroic sacrifice of the women of Carthage in donating their tresses in a vain attempt to build catapults. Fortunately, our present day catapults do not place any such demand upon the fair sex, and the War Production Board is not concerned with this particular production and procurement problem.

Catapults, as a war implement, declined rapidly in use after the introduction of gun powder—until the appearance of the airplane. The early Wright airplane was launched by being pulled along a track by a cable which was attached to a weight in a tower. The idea of catapulting airplanes from ships occurred to Capt. W. I. Chambers, U.S.N., and the first successful launching was made at the Washington Navy Yard on November 12, 1912 by Lieutenant Ellyson, U.S.N. Catapult design and development have progressed steadily up to the present day in keeping with airplane development.

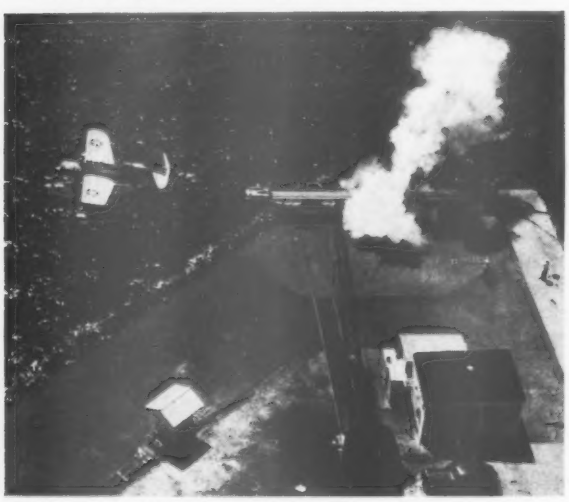
There are three types of catapults now in general service: powder, air and hydraulic. The mechanical system is similar

Although plane drops perceptibly as it leaves catapult, pull of propeller will quickly take this OS2U upward.

in the three types, consisting chiefly of two blocks, each containing sheaves around which a rope is wound with the free end led off and attached to a car. The blocks are separated by means of a cylinder and ram which produces motion of the car at a rate dependent upon the number of sheaves used and the speed of the ram. The air catapult is installed on some of our cruisers and is the lightest catapult available provided air compressors and stowage tanks are part of the ship's equipment. The powder catapult is used on battleships and cruisers where high pressure air is not available. The hydraulic type catapult is used exclusively on aircraft carriers and auxiliary aircraft carriers.

The advantages derived from catapults aboard battleships and cruisers are numerous. The ship does not have to stop and hoist out airplanes, thereby presenting a good target for submarines. Airplanes can be catapulted under sea and wind conditions that would prohibit normal water take-off. Catapulting can be performed at anchor or in restricted areas where it would be dangerous to attempt a water take-off.

A land-based catapult at Pensacola trains pilots for sea duty. Derrick lifts planes from water, sets them on catapult tracks.



The catapults installed on carriers also permit more variation in the way airplanes are parked on board. Of course it is obvious that if complete reliance is placed on the catapult for launching airplanes, more airplanes could be carried. The catapult is considered to be extremely important in the event damage is sustained on the flight deck, since it would provide an additional means for getting the airplanes off.

The fly wheel catapult was developed during the early stages, but was abandoned in favor of our present types when greater power was needed.

To attempt to explain what sensations are experienced during catapulting is most difficult. The airplane starts from rest and in a run of 55 to 60 feet it is travelling at 70 m.p.h. The time is a fraction over one second. The human body experiences no ill effects, and there is no tendency to "black out"; however, the neck muscles cannot prevent the head from snapping back, and a head rest must be used. A recognized authority on catapults once commented on the sensation as follows: "The reader may answer this for himself by sitting in a parked automobile with the engine racing at full speed, the clutch out, and the shift lever in low gear. Then suddenly remove the foot from the clutch and pray. The resulting material damage will probably be considerable, but the question of the catapulting sensation will be answered."

The importance of the catapult is growing day by day, and as super airplanes with great load carrying capacity are developed, the size of airports must be increased or some form of catapult or assisted take-off device be provided. If, after the war, super flying boats are built for trans-oceanic service, the catapult will again prove to be an invaluable asset. The excess power required to overcome water friction during water take-off can be employed usefully in carrying additional passengers or pay load. It is also to be noted that the danger of wrecking a flying boat or injuring passengers due to striking submerged objects, buoys, boats, etc., is practically eliminated by the use of a catapult.

It has been definitely established that catapults have assumed an important place in military applications, and it appears safe to predict that the machines and technique developed by the Navy will find a logical place in the coming growth of commercial aviation.

END

FLIGHT TRAINING

Actual combat experience has proved that Naval aviation training practices in peacetime were amazingly well-planned for actual fighting. Few changes in methods have been needed.

Student pilots going out to their Curtiss SNC advanced trainers.

One of the Navy's biggest "pilot factories" is at Corpus Christi, Tex., where these Vultee SNV's are based.

FLIGHT TRAINING

by Lieut.
JOHN R. HOYT

Lieutenant Hoyt, graduate of the University of California, entered the Naval Reserve in 1934. Two years later he won his Navy wings at Pensacola. Prior to the war he served aboard the U.S.S. "Lexington," and now is engaged in the development of Navy Civilian Pilot Training instructor schools. He formerly served as an inspector in the Civil Aeronautics Administration.

RIGHT after Pearl Harbor was bombed one of the pilots from the famous American Volunteer Squadron (Flying Tigers) came back to Washington. In a secret, oak-panelled conference room, surrounded by a dozen pilots who were considered experts in every phase of training, he was asked this question:

"Lieutenant X, you went through training at Pensacola and you served for several years in the fleet before going to China. You have met the enemy and, it is understood, have shot down several adversaries. In your considered opinion, what changes should we make in our flight training in order to turn out better pilots? In other words, if you had it to do over again, what course would you prefer?"

Lieutenant X didn't answer for several moments. When he spoke, he said, "Sir, I believe it was because of the thoroughness of my Naval flight training that I'm back here today. If I hadn't been taught to fly well and to shoot straight, I never would have survived."

Of course such a flattering statement was no signal for the group to sit back and relax. In the first place the Navy was confronted with an entirely different problem than it faced at the time Lieutenant X was seeing action. We had to accomplish the 20th-century miracle of training more pilots in a single week than we used to train in a year! It meant that we had to solve the problem of using mass production methods and still retain the touch of the artisan. We had the problem of putting an individual into a huge organization—and retaining individuality in the output. We had to teach thousands of cadets not only to fly, but to fly better than cadets had ever flown before.

The size of the problem cannot be seen from mere numbers. Just to say that a huge, 27,500-plane program was inaugurated is not conveying much to a casual reader. But when the reader realizes that such a gigantic undertaking was begun with existing 1940 equipment, instructors and facilities, some idea of the problem is manifest. If the Navy intended to train vast numbers of pilots without lowering previous standards, something drastic had to be done.

Before the bombing of Pearl Harbor a movement to streamline Navy training had already commenced. Experts on flight training were ordered to the Navy Department from every ship of the fleet, to form what is now known as the Training Division of the Bureau of Aeronautics. Then the work began of revising courses, inaugurating modern methods of ground school instruction, and laying plans for the future.

Following the fateful 7th of December, a 27,500-plane program was set up and it was decided to train 30,000 pilots per year. That astronomical figure (or so it seemed then) meant an intake of 2,500 students each month—a rate of entry that was greater in a single week than the total entry for several years.

Most valuable instrument flight training device is the famed Link Trainer. Here a Link instructor at Pensacola shows students route of cadet "flying."

An aviation cadet studying navigation, flying in a PBY, practices "shooting the sun" with octant.

But in early 1942 it was clear that we had not gone far enough. There were bound to be pilot shortages in 1943!

Fortunately there were several ways to combat this shortage. Some pilots proposed cutting down the number of hours given in training; this idea was almost immediately vetoed. *There was to be no reduction in quality, no lowering of standards.* Other pilots proposed to increase the number of training establishments, airplanes, instructors, and facilities. Still others proposed to use the Civilian Pilot Training Program, lightplanes, civilian instructors and to increase the efficiency of the instructors by working them seven days a week.

But it isn't easy to train a modern pilot. In 1918 there were fighting pilots with only 50 hours. Today a pilot flies a plane so powerful, so complicated and so difficult to replace that the idea of putting him into combat with less than 250 hours is not considered. Imagine flying a plane of 2,000 hp. with a landing speed of 90 m.p.h., and capable of shooting six machine guns and a cannon! Imagine taking off from a moving carrier and landing aboard the same vessel—with only 50 hours of instruction and solo!

With that idea in mind, the Flight Training Division was formed in the Bureau of Aeronautics. It proceeded to get down to work and attempt to create order out of chaos, to evolve a plan whereby the fleet would be furnished with *thousands* of pilots—flyers who were even better trained than their brethren. To achieve such an objective, sections were organized to handle training literature, advertising posters, gunnery and ground schools; and a "special devices" section investigated every possible scheme or synthetic device to help training. Finally the flight training section began to work on the practical phase of the problem: to get the most pilots, the best pilots and to train them in the shortest time.

That was the one big, main phase of the problem. The Navy could solve it by using all existing facilities and flying the men seven days a week, getting into full swing as soon as planes and instructors were procured. Obviously the peak load could not be achieved in one night or even in a single month. There seemed to be but one way out: to increase efficiency.

That word "efficiency" is one which causes antagonism. A pilot who has been flying 100 hours a month (which compares with a 60-hour week in other industries) is hurt by the implication that he is not efficient. Also, if an instructor flies

Carrier operations generally are practiced by flight students on strips laid out on an airport. This landing "Avenger" must land within strip limits. The Navy now is getting a number of converted training carriers, to be used on the Great Lakes.

with six students and habitually fails two of them, he is wasting one-third of his time!

Wasting a third of an instructor's time and that of a valuable airplane, is intolerable in wartime. There was but one thing to do: pass everyone who entered training. But that, argued old-time flyers, was unheard of. Not everyone could fly; there had to be washouts. One branch of the military service failed 40 per cent of its cadets consistently—and back in 1935-36 the Navy failed as many.

The word "can't" draws from some people the same reaction as a red flag does from a bull. Almost immediately two propositions were made: (1) use better pre-selection and (2) increase instructor efficiency in spite of the fact that instructors were overworked.

So, while the quotas were jumped at all aviation bases and more and more airplanes were ordered, the research psychologists went quietly back to work on a project that had once been laughed down by the old-timers: the idea of selecting Naval aviators by a written test. There had been hundreds of previous tests—all failures—but this time two combinations were used: one set obtained a background of the student (called a Biographical Inventory) and the other tested his Mechanical Comprehension. By the time 15,000 tests were given it was found that the research men were picking winners nine times out of 10!

This was the first miracle in the training program. By means of it the Navy began selecting only those upon whom the betting odds were in our favor. Today, under the Manpower Commission, selection is made by qualified experts cooperating with draft boards.

The second aid to training—another miracle—was the aid to instructors. In 1940 an ingenious professor at Purdue University devised a series of lessons, which he gave one at a time to students the day before they flew. Thus a student about to do spins would study the page entitled "Spins", and when he flew the next day he knew almost exactly what was to happen and what to do. Results proved that such students knew as much at 25 hours as other students had learned in 35!

There was another aid to training that went along with the flight maneuver sheets. This was a book for instructors, a book which helped the instructor *talk* because it presented the lesson simply and in words easily understood. This book was called Patter.

The Navy was not slow to use both the maneuver sheets and the Patter book. They have been enthusiastically received; the Patter book is to be found in most Public Libraries, where anyone may read it. But the project didn't stop there . . . Later, when Civilian Pilot Training facilities were utilized, both books were loaned to CPT.

The use of CPT came about through the statistics of success and failure among students who had had no previous flight training. It was conclusively proved that if a student had disciplined, well-organized training before coming into the Navy his chances of success were three times those of a green student. (Note that this does not apply to random, uncontrolled flying, which is almost valueless.)

When this became known the Bureau of Aeronautics, through the Secretary of the Navy, immediately requested that facilities of CPT be made available to the Navy. Today the Navy is using its full quota in primary and secondary flight training, plus some cross-country and flight instructor courses.

What has all this meant? Substantially that another 20th-century miracle has taken place, and that the supply of pilots in 1943 will come very close to the demands in spite of shortages of instructors, planes and facilities. It is a case without precedent in the history of aviation.

But the problem was far from solved. Everyone has seen or heard of the "tough" instructor, possibly in the movies, or just by hearsay. The questions arose (1) which were the best instructors, as far as actual flying was concerned and (2) which instructors got the most students through the course?

Obviously, not every human being is a teacher, and not every pilot is an instructor. There were two things to do: first, flight check every instructor in the program and second, be more careful hereafter in the selection of flight instructors.

To accomplish the first point a flight standardization board, composed of seven pilots, was appointed. They were chosen from the three centers: Pensacola, Corpus Christi and Jacksonville. Base by base they made the rounds of the Reserve aviation bases, until each one was checked and standardized. Not only was the flying technique of each officer tested, but also his ability to instruct. That was the main thing: to be sure that those pilots could put their points across.

The second objective is in the process of completion, namely a testing device to ascertain how a pilot teaches, if he likes teaching and if he possesses the attributes of a teacher. As

Following a day's instruction in the air, instructors show aviation cadets their mistakes in chalk on the hangar floor.

Before taking off, a Navy instructor describes to his pupil in detail how to fly a maneuver. Navy now uses many civilian pilots as teachers.

Aviation cadets must pass swimming tests fully clothed. This is part of the course at Chapel Hill, N. C.

the tests are at this point necessarily confidential, little more can be said about them than that they are nearly completed.

So far we've been concerned primarily with the question of meeting quotas and mass production. But how about the pilots—can they shoot? Take off from carriers? Navigate? Bomb? Dogfight? What kind of performance are they going to turn in when they meet the enemy?

Pilots returning from the Coral Sea and Midway battles indicated that our flight training and gunnery methods are definitely superior. When Lieutenant O'Hare shot down those Jap bombers he did so with a limited amount of ammunition, utilizing every round to full advantage. It is gunnery like that, and the fact that the Navy trains students better than ever before, that counts.

For example, students who enlisted as V-5 cadets at Naval Selection Boards went to CPT primary flight training. There they received the rudiments and fundamentals of flight, and there the inept students were weeded out on a low-cost basis in lightplanes—thus saving the scarcer Navy equipment for students who were certain to win their wings. Following that they went to pre-flight schools.

Pre-flight schools have already proved their worth by increasing the tone and morale of aviation cadets. The huge athletic program is just what was needed, and the combined ground school of navigation, math, physics and Naval indoctrination brings the cadets to Reserve Aviation Bases with a solid, adequate background.

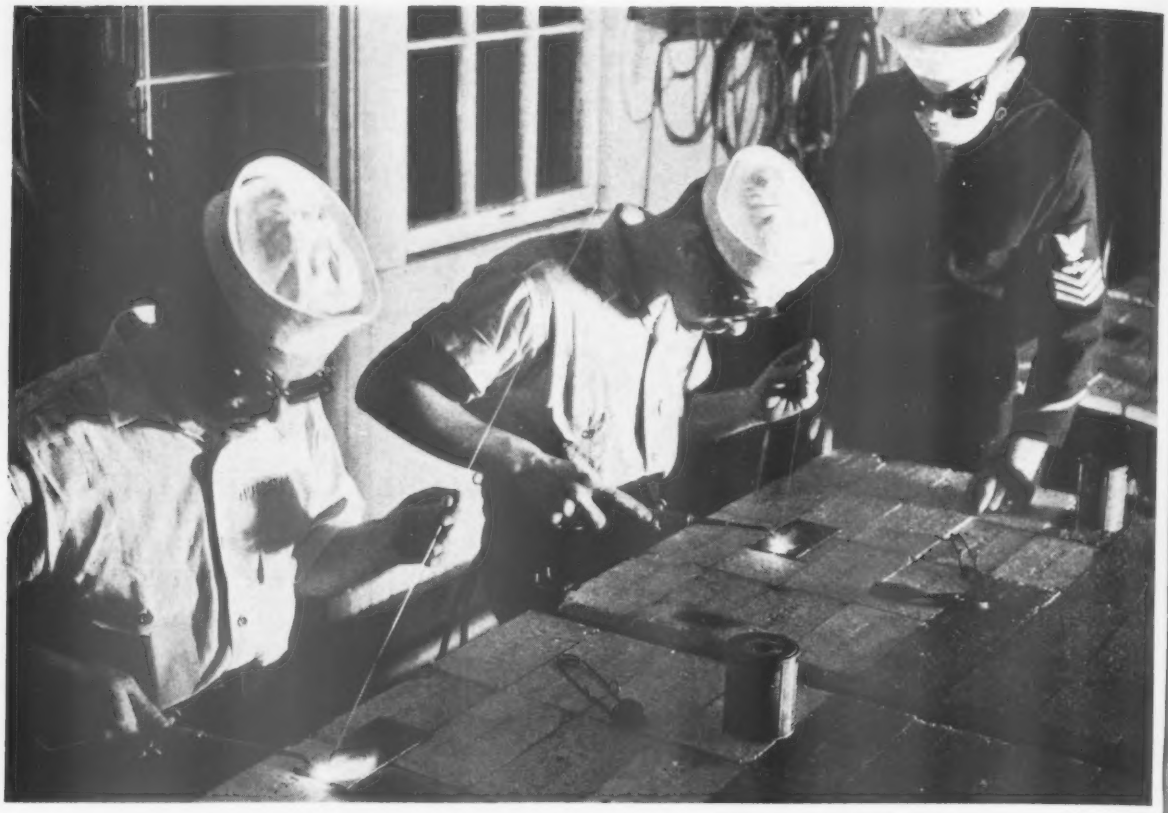
With this behind them they pour into the reserve bases at the rate of several thousand per month (the exact figures are confidential). At 19 bases this primary training goes on in Navy N3N-3's, Stearman N2S's and even Piper NE-1's (*Cubs*). There each cadet receives the basic fundamentals that the Navy believes to be the real foundation of a super-airman, and which marks the difference between the success or failure of the aviation program. By the time his 80 hours in the air at the primary center is completed, an aviation cadet knows how to circle pylons, shoot small fields and emergency landings, do any stunt in the book, fly formation and fly at night. In short, he is ready for service-type airplanes. Larger, faster, heavier planes are flown in intermediate training—at either Pensacola or Corpus Christi. The flying becomes specialized, and after a certain amount of indoctrination in North American SNJ's, assignments are made to either Carrier, Patrol, or Observation-Scouting. As most of the students will be assigned to Carrier (called CV) training, here's a bird's eye view of it:

There are four types aboard a carrier: fighters, bombers, scouts and torpedo planes. Sometimes the types are combined, such as torpedo bombers, in which case the pilot may do both high-altitude bombing and torpedo dropping. In each course a cadet receives the intensive training required to make an expert of him—a specialist who can do the job assigned to him and do it well.

The students who get Patrol or Observation-Scouting (called *VPB-VOS*) finish their training in seaplanes, learning to take off, taxi, weathercock and sail. The intricacies of navigation are things that they learn perfectly, because it is obvious that a score of 100 per cent must be made in navigation at sea. It is no consolation to make a grade of 75 per cent if that margin of error fails to locate the ship!

At the end of approximately seven months from the time they began to fly, cadets receive their wings and commissions as ensigns, USNR. But the final touch to their training has

(*Continued on page* 275)



An Aviation Metalsmith, First Class, instructs two technicians in the science of acetylene welding.

TECHNICIANS

by Lieut.
FRED TUPPER, Jr.

With a journalistic background including posts with the Burlington, Vt., "Free Press," United Press and New York "World-Telegram," in addition to public relations activity for the World's Fair in New York, Lieutenant Tupper was selected for assignment to the training literature section of the Bureau of Aeronautics. Born in Burlington, Vt., he attended Vermont University.

These are the men who are specialists at fighting as well as welding, engine maintenance and carburetion. As back-seat gunners they have shot down dozens of Japs.

"J. D. GODFREY, ARM/3c, two Japanese planes," read the brief communique from headquarters of the Pacific fleet. That was all; just another statement buried in the welter of headlines from the Solomon Islands action, just a couple of hits in the overall engagement that destroyed 96 Japanese planes.

That was all—unless you were there and could have seen it. You would have seen Ens. A. W. Hanson maneuvering his dive-bomber high above a Japanese carrier, ready for attack. Then you would have seen four Nakajima bombers moving in, like wolves at a feast, to "mow him down." Godfrey, rear seat gunner, went into action against overhelming odds. His machine gun barked. One Jap plane plunged flaming into the sea; the rest, damaged, sheared off and ran. The way clear, Hanson dived, riveted his bomb dead against the carrier deck and then, his mission accomplished, high-tailed for home. Came more enemy bombers: four Aichi's guns blazing as they bored in for the kill. Godfrey and Hanson cut loose with the free and fixed guns, scored again—and again.

Godfrey and men like him—men like Radioman-Gunner John Liska, who got three Japs in the Coral Sea battle; like Radioman Allen Brost and Achilles Georgiou, who scratched up victories at Marshall and Gilbert, are the unsung heroes of modern warfare. They are aviation technicians doubling in brass—loading the bombs, repairing the wings, tapping out code messages and then, in the midst of the action, firing the machine guns that may mean the difference between life and death to the pilot in the front seat.

The aviation technician is the backbone of Naval aviation. He is the man of the hour, the man behind the man in the cockpit. And, as such, he has one of the prized jobs in Naval warfare today.. The Navy wants 100,000 like him this year and every year until the war is won. Enlisted men everywhere are seeking that opportunity.

The aviation technician, as his name implies, is a highly trained specialist. The Navy has gone all out to make him just that. It has spent millions of dollars on new schools, it has procured top-flight equipment and it has brought seasoned experts back from the war zone to give these men the best

Navy parachute riggers train and get refresher courses at the Naval Aircraft Factory. These are working on 'chute packs.

possible training to do the important job that has to be done.

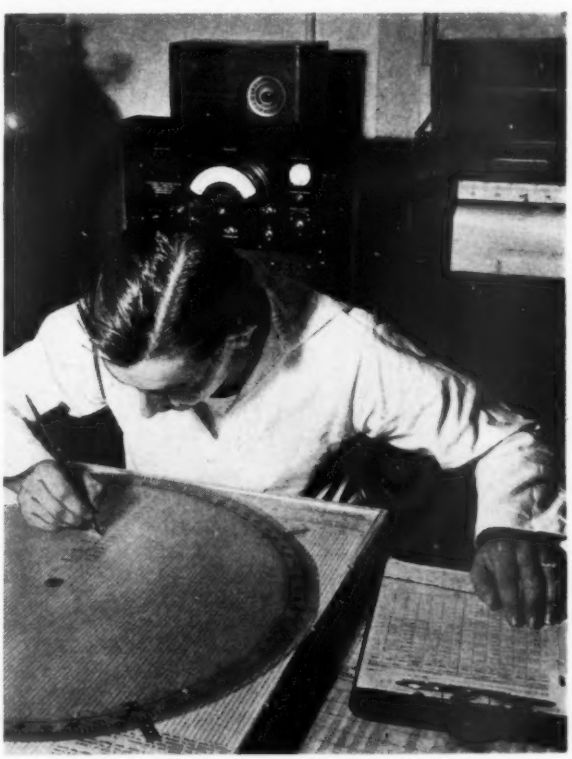
At Jacksonville, at Chicago's Navy Pier and at two huge plants that have mushroomed overnight from the cornfields at Norman, Okla., and Memphis, Tenn., the aviation technician is learning the tools of his trade. As an aviation mechanic (AMM), as a metalsmith (AM) on ordnanceman (AOM) and a radioman (ARM) he will receive an average of six months specialized training, then he will move out to active duty with the fleet. Some of the technicians, those who are physically and temperamentally qualified, will go on to gunnery school and graduate as fighting members of flight crews ready for action.

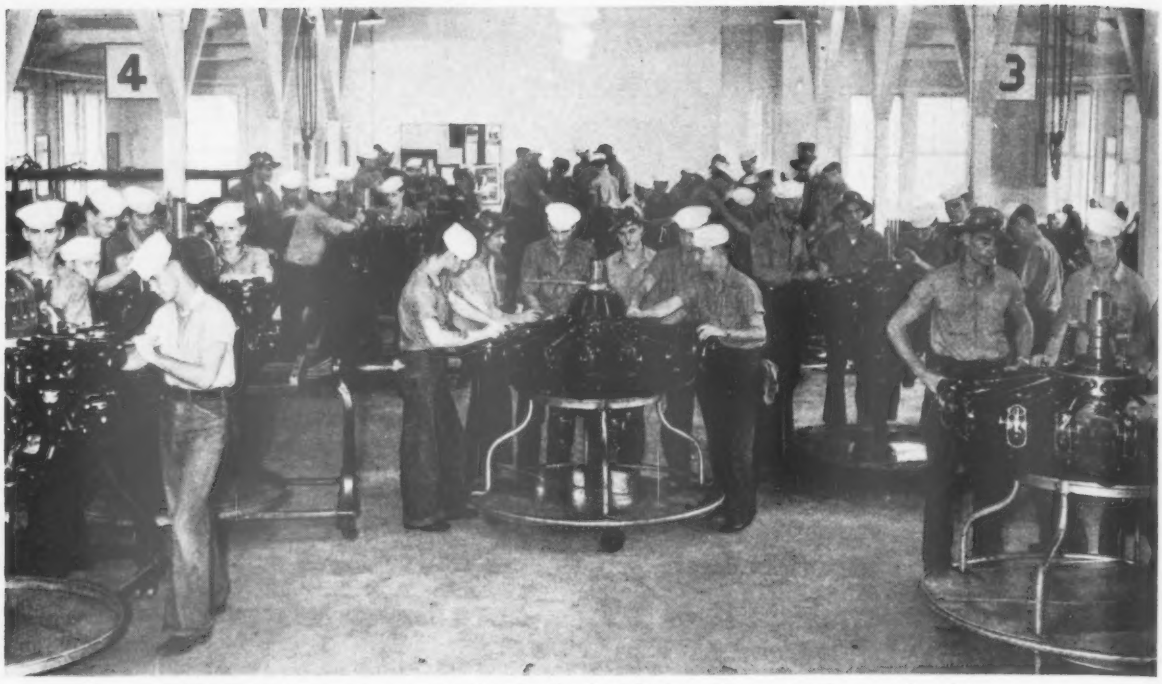
This, by and large, is a young Navy that is going into aviation, composed of men who will use their training for the war and for the years after it. They are, on the average, 19 years of age, and have from two to four years of high school. While most of them know little of mechanics and less of the intricacies of aviation, they have that peculiarly American trait of mechanical adaptation and ability to learn because they want to learn. "It's the volunteer for a job, the man that really knows what he wants, that learns fastest," say instructors at the service schools. All these men have volunteered for Naval aviation.

Aviation technicians come from the top drawer of the country's manpower. They are picked, during their early weeks in "boot" camps, strictly on their merits. They take intelligence and adaption tests and the highest percentage are granted the opportunity of assignment to aviation technical schools for training. To fly and fight is their ultimate goal. School is the requisite to that end. The majority will be graduated in one of four main aviation technician rates with the promise of rapid advancement.

Let a seaman, Frank Smallwood, express how the Navy enlisted man feels. "I joined the Navy three years ago," he says, "to travel around the world and see all those beautiful dames —just like it is in the movies." Things are different now. His buddy is gone, one of that battalion lost in the Pacific. Smallwood's been strafed by Jap machine gun fire, swam for safety

One of the most coveted technician posts is that of aerographer. He must be an expert on all phases of aerology.





Aviation Machinist Mates are trained at the Naval Air Station at Pensacola. They are given instruction in maintaining all currently used types of aircraft engines. Training covers 670 hours over 24 weeks.

Navy mechanics specializing in propellers must know operating details of complicated electrical and hydromatic prop hubs.

when the carrier *Lexington* went down. "I'm going back," he says, "and this time I won't be taking it, I'll be in a plane crew, brother—dishing it out."

Smallwood is one of 10,000 sailors aboard the Navy Pier, a five-eighths-of-a-mile finger that pokes into Lake Michigan. These men eat, sleep, drill and work in the narrow confines of this miniature metropolis and, after six months, graduate at the rate of 300 a week as Aviation Machinist Mates third class or Aviation Metalsmiths third class.

Time is short and training must be carefully presented to get Smallwood and his comrades out into active service as quickly as possible. At the Pier 670 hours are crammed into 24 weeks—and that includes, in addition to shop and classroom work, fundamental training in signaling, machine gun maintenance, gunnery, marksmanship, firing and military drill. A mechanic, in the Navy book, must be a triple-threat. He's the handy man of aviation.

A day at the Pier is like a day at any of the other service schools. The schedule is long and concentrated. There are four hours of shop, two hours of classes and from two to three hours of physical exercises and military drills for every technician.

For technicians in all principal categories—AMs, AMMs, ARMs, and AOMs—there is a basic shop curriculum designed to give them general knowledge and use of hand tool, tool boxes and fundamental shop mathematics. After this stage, usually of two weeks duration, the men diverge into different curricula.

A mechanic, like Smallwood, must know every phase of maintaining and operating an airplane and its equipment under all service conditions. He may have to do other things, too, under the press of emergency. At Los Banos in the Philippines, early in the war, the Japs came over and strafed two PBY's on the ground. The lone man on hand was Machinist's Mate Roland Foster. He was more than equal to the emergency. The first Jap bursts set the planes afire. Foster rigged the bilge pump and fought the flames. Then, as the Japs came back, he manned the bow and then the waist guns. Scrambling back and forth he put out the fires and drove the enemy away. The battle over, 200 bullets were found in the punctured planes. Foster was alive. More than that, he was calmly working on repairs.

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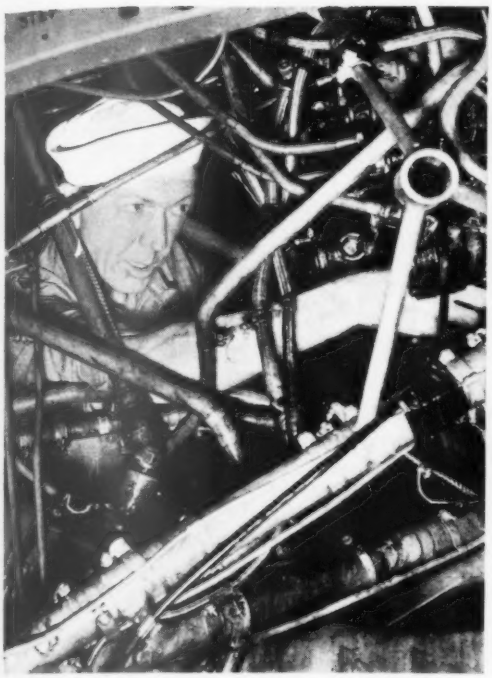


A few hours after working on this scout bomber, this AMM may well be flying in its back seat as its gunner.

Specialists in aircraft instruments are highly important to Naval aviation. This mechanic is calibrating instruments on a testing machine.

Machinists mates are installing reinforcing strips on an aircraft wing tip, under the supervision of a chief petty officer. Navy mechanics in the field can all but build a complete plane from spare parts.

SELECTION BOARD

The task of sifting the wheat from the chaff among the hordes of young applicants has been capably handled by these groups.

by Capt.
JOSEPH B. LYNCH

Since 1935, Captain Lynch has been on duty in Washington as officer-in-charge of the officer candidate section, "Vee" programs, Naval officer procurement division. A Harvard graduate in 1914, he enlisted in the Naval Reserve that year, serving as patrol plane pilot, flight instructor and squadron commander at the Naval Air Station, Miami, Fla., during World War I.

"Average American boys, with the spark of leadership" being sworn into the Navy.

ANYONE who ever sat in an interview with a prospective Naval aviation cadet appreciates the delicacy of the task of selecting trainees.

Fortified with all information available, the interviewing officers know the applicant so well, by the record of the man, that the weight of one remark or another results in a truly fine balance of judgment. In fact, the applicant's past and present character and his potential ability are perhaps better known to the selection board officers than to his own parents.

His jacket of data, gathered from all sources—school, church, home, civic life, employment—is a summation that probably would amaze the applicant himself. And by the time mental and physical tests are marked, the information is such that an interviewing officer's job simply becomes one of learning whether the applicant has that spark which goes for leadership and the other qualities of character exacted by the Navy of its aviators. Oftimes in an interview, a single remark by an applicant will be quite revealing over and beyond what is shown in the record.

Asked the viewpoint of his parents, one applicant for V-5 replied: "My father thinks it's a good idea, sir."

"And your mother?"

"Well, sir, er—" said the 19-year-old, "Well, er, you know how women are, sir! But—"

"You mean she can't quite make up her mind?"

"Yes, sir, that's it; but she'll be proud, too, if I'm accepted."

Evidently the young man was a student of extra-curricular subjects. Added to achievements normal for his age, his tact may well have swung the balance in his favor.

Despite all the pother made in public concerning the great junior athletes and others of wide reputation, the man the Navy and the Marine Corps are looking for is the average American boy—average in ability, in school, in society, in his family, in his recreation, in all his activities. That and the spark of leadership, make perfect material.

As one board member said: "It doesn't take a genius to be a flyer. Take the average American. If he has a measure of the stuff that makes for leadership, a dash of cockiness and a sprinkling of mechanical aptitude, he will readily become the kind of flyer wanted in Naval aviation. Fact is, there is no better material anywhere and the results of our selection prove it."

Until recruiting ceased, this selection was done through 15 Naval Aviation Cadet Selection Boards. Each has headquarters in a center of population—Boston, New York, Philadelphia, Washington, Atlanta, New Orleans, Dallas, Los Angeles, San Francisco, Seattle, Minneapolis, Kansas City, St. Louis, Chicago, Detroit.

Under the War Manpower Commission, the authority of the cadet boards will be assigned to Selective Service boards. However, some provision for retaining the services of Cadet Selection Board members, with all their valuable experience, will undoubtedly be made.

The boards are made up of officers and men skilled to do the job. They know what the Navy and Marine Corps want and how to get it. They are helped by clubs, civic groups, mechanics, professors, publishers, teachers, merchants, radio executives, citizens from all walks of life.

Citizen's committees, auxiliary to the selection boards, operate as liaison between the selection board they serve and the communities in which committeemen reside. Here the Navy is indebted to the spirit of America. Such citizens, individually or by groups such as fraternal organizations and service clubs, co-operate closely by making nominations, forming aviation cadet squadrons, organizing special preparatory school courses, in short, carrying the banner for Naval aviation.

As do the members of the board itself, the civilian committeemen live and breathe Naval aviation. They are informal and local, however, and confine their energy to home territory. Too, they are unselfish civilian volunteers. Glad to help, they seem to have no limit of time and energy and ability with which to serve their board.

Heretofore, the span of distance between individual localities and headquarters of the boards has been made by the boards themselves. Doctor, dentist and psychologist, with the yeoman and one or two line officers, climb into a Navy station wagon and are off to the far places in their individual board's area.

The traveling board, in most areas, has performed the identical function as though sitting at headquarters—interviews, examinations, inductions. Thus, by visiting the home communities, the travelers saved time and energy and expense. Those localities outside the reach of the travelers' course, or beyond the scope of a visit, were served ably by regular Navy stations and substations. Applicants who passed "screening" tests were sent, at Government expense, by the recruiter to the selection board headquarters.

At least 30,000 Naval and Marine aviators will be trained in 1943. Paul V. McNutt, Manpower Commissioner, has announced that each selectee may indicate his preference for duty, and efforts will be made to assign men to their preferred branch of service. Every American youth who wants to win his "Wings of Gold" will have his chance to apply.

TRAINING FILMS

One of the most successful modern methods of teaching highly technical subjects in minimum time is with camera and projector.

by Lieut.
THOMAS ORCHARD

After graduating from Hobart College in 1931, Lieutenant Orchard became associated with the early development of "The March of Time." In 1938, for his work in news motion pictures, he was awarded an honorary Master of Arts degree by Hobart. He joined the Naval Reserve in 1940, was called to active duty in 1941 and now heads the Bureau of Aeronautics' training film unit.

A FEW months ago in a room of the Bureau of Aeronautics in the Navy Building in Washington, a young lieutenant, with the golden wings of a Naval aviator gleaming above his ribbons, was giving a lecture. But his class did not consist of fledglings, student pilots or cadets. The 50 or so men carefully listening to him all outranked him. They all had wings and most of them had three stripes or even more. But the lieutenant had the floor.

Experience is the greatest teacher of all, and only the lieutenant in that assembly had had the experience of actual combat in World War II. He had flown and fought at Coral Sea, at Midway and at Wake. He had now returned to Washington to give his experience to his superiors, men with judgment and training, men who could understand the lessons, and who could determine the future program of training in Naval aviation.

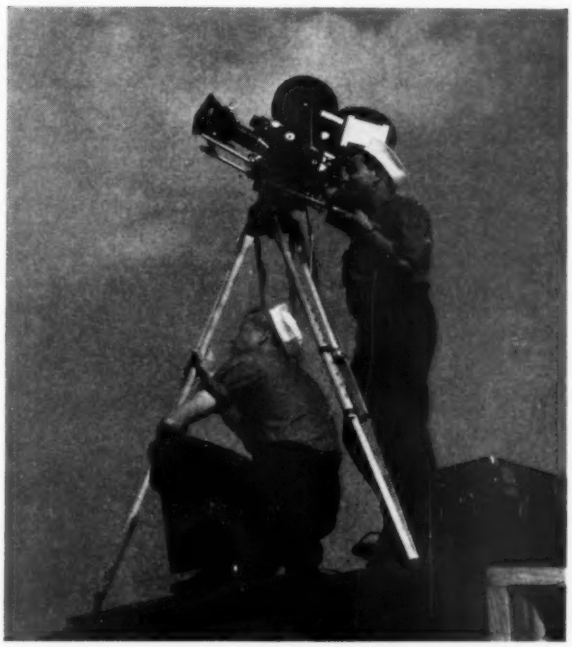
The lieutenant was finishing his talk. "One of the chief headaches we run up against in combat is training new men to take the place of pilots who have been lost. Time is short; pilots are valuable. But as they come to us from training, they must learn actual combat technique. Some of us have learned from combat itself, and have been passing on the lessons we have learned. That's a difficult thing to do with just words, and there's no way we can pass on our tricks to men who are meeting the enemy on other fronts.

"To my mind, motion pictures can do this job better, more effectively, more dynamically than any other medium. When you combine sound and pictures, you've got something that gets closer to actual combat than anything except the real thing. It's a training device that will teach men and bring old timers up to date quicker than anything I know, and the lessons will last longer. Give us more movies of the right kind, and you'll see our record jump!"

This wasn't the only request for training films. Faced with training programs accelerated almost unbelievably, requests and even demands came in to Washington for films on almost all of the thousands of subjects which Navy men must learn. "Boot schools," taking in new recruits fresh from the farms and the city streets, needed films to explain shipboard procedure. Indoctrination schools, given two months to turn young men without previous experience into responsible officers, called for films on tactics and maneuvers. Aviation service schools, trying to turn out thousands of skilled mechanics a month, wanted such subjects as aluminum welding and doping. The pilot training program, soaring to unheard of heights, sent in requests for films on formation flying, torpedo plane tactics, and so on.

Let's take just one of these problems and see how training films do their bit. Pilots on Navy patrol planes all over the world have to keep a sharp eye out for submarines, and submarines are not easy to see. If a pilot sees a sub on the surface from a distance of four or five miles, a crash dive will have submerged it by the time he arrives in position to drop depth bombs. All that will be left is a swirl in the choppy surface of the ocean, and perhaps a little bit of the wake. From this scant evidence, the pilot must estimate the course of the sub, and its depth, so that his ash cans can find their mark.

Unfortunately, most pilots, when they first report to patrol duty, have seen very few submarines from the air, and those they have seen are American, not German or Japanese. Few enemy subs have been captured to be used as teaching devices.

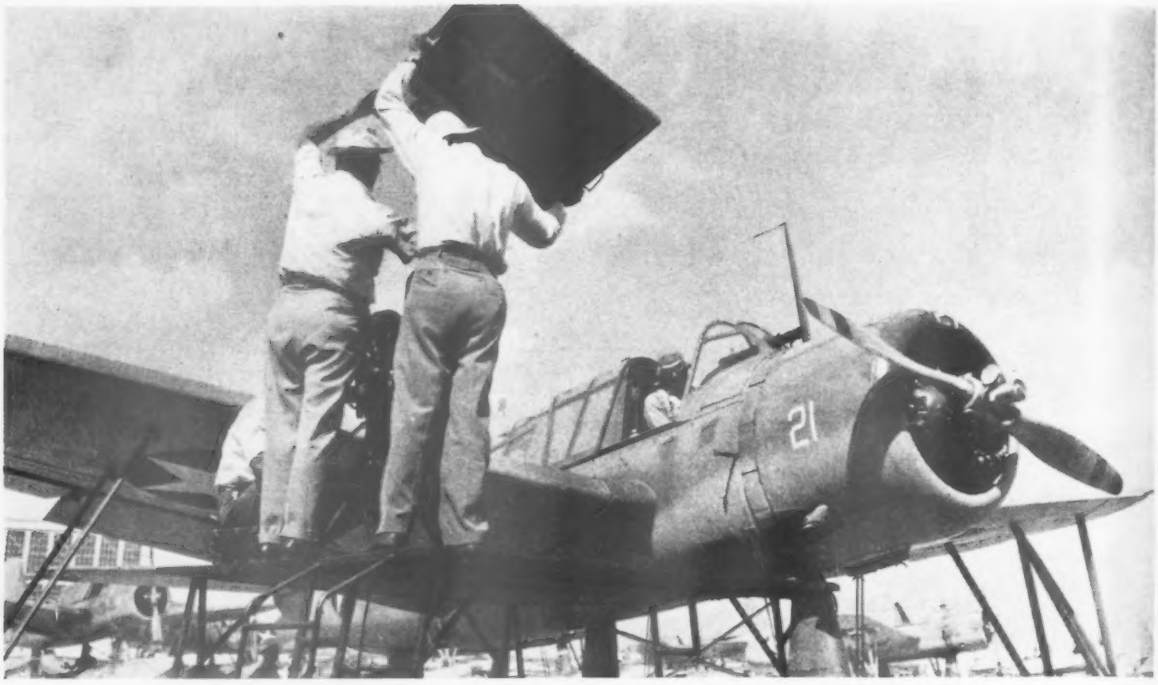


A Navy motion picture crew, shooting a flight training film, photographs perfect landings and take-offs by expert pilots.

Most of those we have discovered we have destroyed. Then, too, wherever the pilots are trained, during their course they cannot encounter all types of subs in all types of weather conditions in all the oceans. But they need that sort of information if they are to perform their jobs effectively. Only training films can supply the lack, and they are doing it. The training film unit of the photographic section, Bureau of Aeronautics, is producing a series of movies and slide films on the subject and new pilots will soon know more about it than many men already in service.

This is only one of the hundreds of problems met by the training film unit. As this article is being written, almost two thousand separate projects are under way, and every day this number is growing. To handle this production, there is a staff of 100, including officers, enlisted men and civilian employees. That is a far cry from August, 1941, when the unit was set up with a staff of just five. While security has decreed that some subjects be made entirely by Naval personnel, the majority are made by commercial firms under contract closely supervised by Navy experts. Yet the photographic section can't keep up with the increased demand for pictures. As films are put in use, more and more Navy instructors are learning the benefits of this type of training and are literally yelling for films answering their immediate needs.

One of the difficulties of making training films is keeping



Shooting a training film scene featuring the pilot of a scout-observation plane, at Jacksonville, Fla.

up with the latest developments. In this fast-moving war of today, new devices, new methods, new techniques are developed almost overnight. But once a film is made, it can be changed only by a complete overhaul and remaking. Thus it is of great importance to see that only the very latest experience goes into a training film. The work of the training film unit, its very presence in the training program, has forced instructors to revaluate their processes. In many cases training film unit officers have contributed to techniques and tactics.

Three types of men are needed in making any film: the technical expert, the educators and the production men. Each contributes his share, and together they can produce a film that is technically accurate and efficient as a teacher. From the very first, these three categories began to overlap and to learn from each other. The film man finds himself becoming an expert on gunnery. The technical advisor, in making himself clear to the educator, becomes something of a teacher himself. With the aid of the teaching film, the military man who knows his subject becomes in addition a competent teacher. This is

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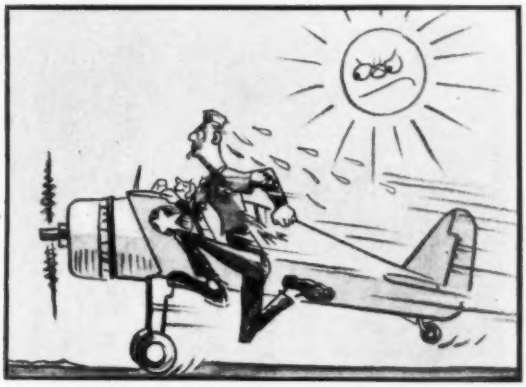
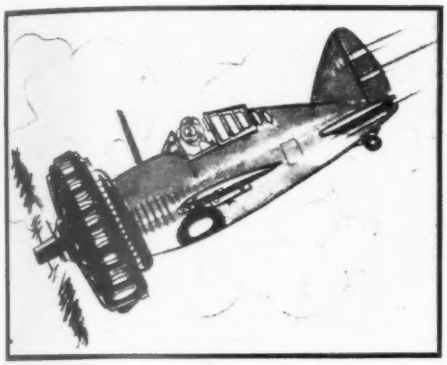
This scene is part of a training film dealing with landing and take-off operations of Navy patrol blimps.

Dilbert finds out why you use all of a field for take-offs.



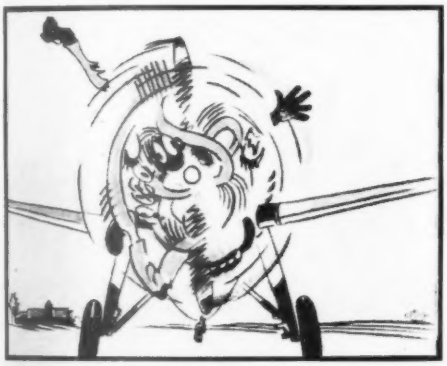
Wing men are always run ragged when Dilbert taxis.



He frequently uses 1,000 h.p. but no horse sense.

DILBERT

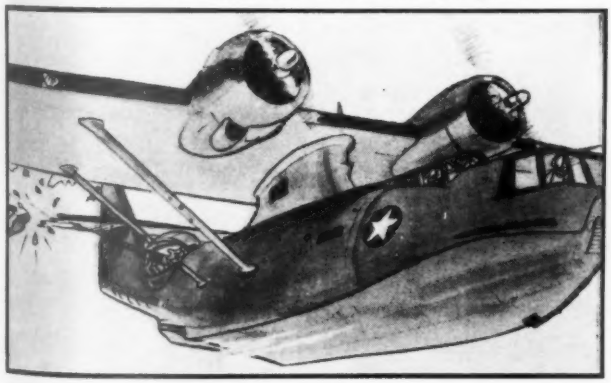
THAT Chinese proverb, "One picture is equal to a thousand words," has been put to work by the Navy's Bureau of Aeronautics to point out the pitfalls every Naval aviation cadet should avoid. Dilbert, star of the poster series, is one aviation cadet who just won't learn. Whether it is his natural cussedness or sheer stupidity, not even his instructors can say. Actually, Dilbert loves to show off. This trait makes it possible for cadets to profit from his mistakes. There are 264 posters in the series, depicting his dismal performance in flying, navigation, ground school, gunnery, etc. Dilbert's deaf-dumb-and-blind flying has had a marked effect on careless Naval aviation cadets who learn, pleasantly and safely, what not to do in or with an airplane.



He never checks the switch before pulling the prop.

Dilbert is just an accident looking for a place to happen. He generally finds it.

Dilbert's a crack shot, never misses the tail of his plane.



A new group of enlisted WAVES march to drill at Smith College, Northampton, Mass. Officer at right is an ensign.

The WAVES

by Lieut.
JOY BRIGHT HANCOCK

Until she was recently commissioned a lieutenant in the WAVES, Mrs. Hancock was in charge of the Editorial Research Section of the Bureau of Aeronautics. A native of Wildwood, N. J., Lieutenant Hancock joined the Navy in 1918 as chief yeoman. She first soloed in 1928, is the author of a book and numerous articles on aviation and is recognized as an expert on Naval aviation.

Further proof that it's everybody's war is this organization of "petticoat admirals." WAVES are replacing male officers at desks.

THE Women's Reserve of the Naval Reserve, already widely known by the informal although officially recognized title of WAVES, was established by an Act of the Congress on July 31, 1942. This group, a definite part of the Navy itself (neither a corps nor an auxiliary) is precedent-breaking—it is the first officer and enlisted reserve in any military service in the United States to be composed entirely of women.

This is not the first time that women have served in the Navy. Those who remember World War I may recall the "Yeomanettes" of 1917-18. Nearly 12,000 women were enrolled during 1917 and 1918 as Yeomen (Female), United States Naval Reserve Force, for four years or the duration.

In those days few women had been trained for specialized fields. The enrollees at that time were accepted for service as clerks, stenographers, typists and telephone operators.

During March of 1917, while the United States was moving toward her final decision to enter the World War, the Navy realized that its need for clerical assistance was far greater than had been anticipated. The shore stations whose activities had been greatly increased by the preparation for war were unable to release trained men for the Fleet—instead they were clamoring for additional assistance. To solve the problem, the Secretary of the Navy, Josephus Daniels, turned to the Civil Service Commission. But the Commission was not able to supply the needed personnel, nor was an appropriation available.

Undaunted, the Navy's Secretary asked, "Is there any law that says a yeoman must be a man?" The answer was, "The

Reviewing WAVES' Washington staff officers.

Lieutenant Commander McAfee.

law does not specify 'male.'" "Then enroll women in the Naval Reserve as yeomen," he said, "and we will have the best clerical assistance the country can provide." Under provisions of the Act of August 29, 1916, the Naval Reserve Force was established, and on March 19, 1917, all commandants of Naval districts were informed that women should be enrolled as yeomen, electricians (radio), or such other ratings as the commandant considered necessary to the district organization. As a result, a total of 11,275 Yeomen (F) were in service at the time the Armistice was signed and most of the immense volume of clerical work at the Navy Department, in addition to many highly important special duties, was being handled by them.

In addition to the purely clerical duties performed by the Yeomen (F), others served as translators, draftsmen, fingerprint experts, camouflage designers and recruiting agents. Five Yeomen (F), enlisted in the Bureau of Medicine and Surgery and served with Navy hospital units in France. One served in connection with the operations of the office of Naval Intelligence in Puerto Rico.

Yeomen (F) were stationed at Guam, the Panama Canal Zone and Hawaii, in addition to the United States and France. About 300 marinettes, as the feminine enlisted personnel of the Marine Corps were designated, were on duty during the war. Most of them were stationed at Marine Corps Headquarters at the Navy Department although a number performed valuable service in connection with Marine Corps recruiting.

All Yeomen (F) were released from active duty by July 31, 1919, and to them Secretary Daniels sent the following message: "It is with deep gratitude for the splendid service rendered by the Yeomen (F) during our national emergency that I convey to them the sincere appreciation of the Navy Department for their patriotic cooperation."

Three months after the passage by Congress of the Act authorizing a women's reserve for use in the present struggle, the Navy Department on July 30, 1942, announced pertinent details concerning the commissioned and enlisted branches and the aims of this new branch of the Naval Reserve. Limited by law to service within the continental limits of the United States, the officers and enlisted personnel of the Women's Reserve upon completion of training will relieve male personnel on shore billets for duty at sea.

An advisory educational council, made up of eight nationally-known women, assisted Navy officers in drawing up requirements for the Women's Reserve and in planning the training course. Miss Mildred H. McAfee, president of Wellesley College, a member of the advisory council, was named the Director of the Women's Reserve, with the rank of lieutenant commander. The enabling legislation stipulated that in addition to the directors, there should be 35 lieutenants, senior grade.

Already 14 of the billets have been filled by especially selected personnel serving on the administrative staff and in district procurement offices. The balance of the commissioned officers will be lieutenants (junior grade) and ensigns, the former limited to 35 per cent of the total officer personnel.

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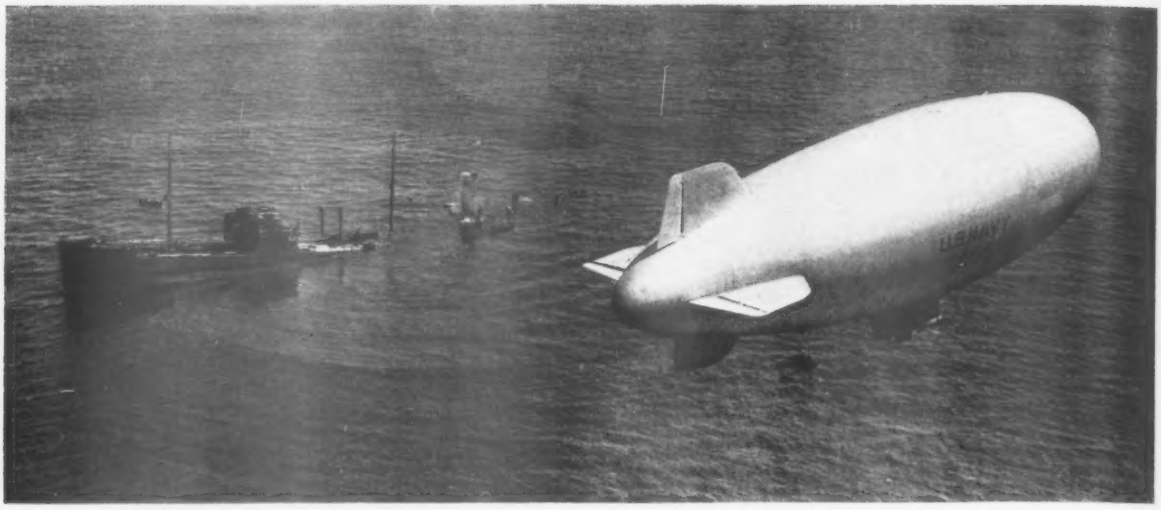
LIGHTER-THAN-AIR



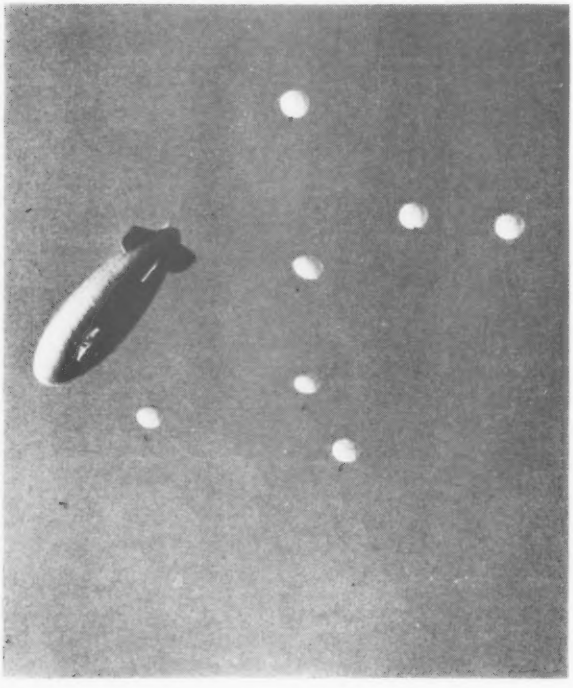
Blimps have saved many lives by speeding to the scene of sinkings, locating survivors and dropping supplies.

Performance characteristics of Navy nonrigid airships gives them an advantage in protecting convoys and coastal shipping.

by Capt.
T. G. W. SETTLE

Now senior airship officer in the Bureau of Aeronautics, Captain Settle graduated from the Naval Academy in 1918 and until 1922 served on destroyers in European and Asiatic waters. He was in the airship branch of the Navy until 1934, and was an observer on several voyages of the "Graf Zeppelin." He was the Navy's inspector during the construction of the "Macon" and "Akron."

Blimps have been found ideal in the training of Marine paratroops. Slow cruising speed provides excellent "springboard."



THE nonrigid airship, commonly known as the blimp, is an effective member of the anti-submarine team in our coastal waters. The other members of the team are the several types of coastal surface craft, airplanes and the shore organizations which control the operations.

This is not a new role for these ships. In the last war they were used by all the major belligerents in European coastal waters and by us in American waters. The United States established airship stations on the French coast of the Bay of Biscay, on our continental coasts and in Panama. The British maintained an average of 56 blimps in service in home waters between June, 1917, and October, 1918. In that period their ships flew 60,000 ship-hours at sea, carrying out patrol and escort missions. Many submarines were sighted and either attacked by the airships or turned over to surface "teammates" for tracking by underwater sound equipment and attack. Many hostile mines were sighted, reported or destroyed.

The Germans, too, used their Parseval blimps similarly in the Baltic and in the Helgoland Bight. The French airship arm was active in the Bay of Biscay and in the Mediterranean, and the Italians used a few nonrigids and semirigids in their coastal waters. The American and British airship arms turned in perfect escort scores—no blimp-escorted convoy lost a vessel to enemy submarines.

But their good war record was not enough to save lighter-than-air craft in the disarmament decades after 1918. Airships all but became extinct. There was reason enough for this insofar as European waters were concerned, since the development of airplanes soon robbed the blimp of its utility in a "close-coupled" war on that continent. But why our country should have followed the European lead in this matter is inexplicable.

Soon after the present war broke upon us, we had submarines swarming along our Atlantic coast. And to oppose them

(*Continued on page* 266)

LIFE-SAVING EQUIPMENT

Hundreds of airmen owe their lives today to one of the many ingenious life-saving devices found in every Navy plane.

An aircrew member climbs into a one-man rubber boat.

1 Pilot turns valve of carbon dioxide flask inflating one-man rubber raft, now carried in all Navy single-seat fighters.

2 The life raft inflates in 60 seconds. Pilot then grabs the seat under his forearm to hoist himself on board.

LIFE SAVING

by Comm.
JAMES E. SULLIVAN

A graduate of the Naval Academy in 1924 and now in charge of the equipment and materials section of the Bureau of Aeronautics, Commander Sullivan is a member of the engineering and maintenance committee, Air Transport Association; chairman, Federal Specifications Committee on Aluminum Alloys; member, materials committee, NACA, and several SAE technical committees.

STRIKING power depends on manpower—the men who fly the planes, navigate them, pull the bomb-release levers and operate their guns. To keep the offensive rolling means that these men must be kept on the jobs they know best.

Development of safety devices for the Navy airman has paralleled the progress in design and operation of the aircraft itself, in an effort to meet the increased hazards of aerial warfare. A variety of equipment has been developed within the last few years which daily is credited with saving men in order that they might fly again.

The items range from the safety belt, which every aviator has come to regard as no less commonplace than the shoes he wears, to the ingeniously designed carbon-dioxide-inflated life rafts, which may carry from one to seven men.

Design requirements for aircraft safety equipment are difficult to fill. Such devices must be light in weight and small and compact. Fighters and bombers have no waste space. Safety gear which is carried must be designed for installation in such a manner that it does not interfere with military equipment. At the same time, it must be located so as properly to serve its intended function and be instantly available when an emergency arises.

Weight is a factor of primary importance in the design of safety equipment. The engineer and pilot know that for every six pounds of additional equipment placed aboard a plane, one less gallon of gasoline can be carried, if weight limitations are not to be exceeded. Overloading a plane directly affects the distance needed for takeoff, rate of climb and service ceiling. In combat flying these are factors which cannot be sacrificed, even for safety's sake.

Self-sealing fuel tanks, while not primarily an item of life saving equipment, have nevertheless won a place in that category and cannot be disregarded in any listing of aircraft safety devices. A burst of machine gun fire into an unprotected tank can instantly convert an airplane into a flaming pyre. Use of the self-sealing tanks, together with self-sealing fuel hose, has greatly reduced the vulnerable area and fire hazard in Naval aircraft, lessening losses of both men and aircraft.

The idea of making the safety belt standard equipment on every plane is credited to Vice Adm. John H. Towers, now Commander, Naval Air Force, Pacific Fleet. Its development followed immediately after the Navy's first aviation fatality on June 20, 1912. Ens. W. L. Billingsly, pilot of a Wright seaplane, was killed when thrown from the plane at an altitude of 1,700 feet by a sudden atmospheric disturbance. His lone passenger, Admiral Towers, then a junior grade lieutenant, was more fortunate. He managed to grasp a projection on the plane and fell with it. Although severely injured, he lived to tell the tale and planted the safety belt idea where it subsequently bore fruit.

Of simple design, the belt holds the pilot and other crewmen in their seats. The wide, thick, fabricated webbing which secures the airman across the thighs is capable of withstanding a pull of 1,600 pounds—sufficient to prevent injury in all but the most severe crashes. They are secured to the base of seats.

Time is precious in many cases when the aviator must bail out or free himself from a crashed plane. The belt is designed with the quick release buckle in the airman's lap. It trips from left to right in an easy manner. This procedure has been standardized. Release is instantaneous. The loss of a few seconds may mean the difference between life and death.

Probably the most familiar and also the most spectacular

3 Pilot then grabs opposite side of raft and throws himself horizontally across the boat, keeping it upright.

4 Safely aboard, pilot gets out collapsible oars (stowed on the raft) and is ready to propel craft toward safety.

device of aircraft life saving equipment is the parachute. So satisfactory did 'chutes prove that they have, as is well known, been put to extensive use for landing troops from air transports. In March, 1924, when parachutes became a symbol of safety in the air the Navy issued orders requiring their use by all occupants of aircraft. Seven months later Chief Gunner W. M. Coles became the first Naval man to be saved by a 'chute when he leaped from a disabled plane at San Diego.

A parachute is only as good as its rigger, a Navy airman once remarked. The lives of flyers who are forced to use parachutes rest in the hands of the riggers whose duties entail the packing and servicing of all parachutes. Faulty packing can easily result in the failure of the big silk "sheets" to open.

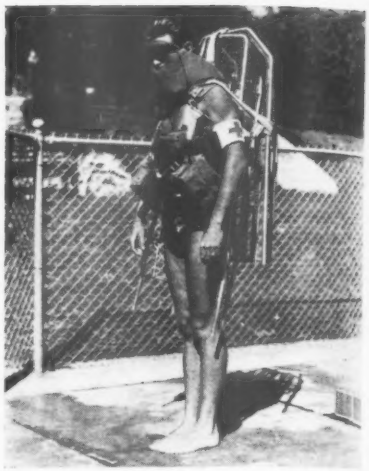
One of the requirements to be a parachute rigger in the Navy is for the candidate to pack a 'chute and jump it himself. Several years ago an example of the effect of this requirement was strikingly illustrated. A newly-assigned rigger was questioned as to his ability to pack parachutes. After detailing his experience and qualifications, he still detected doubt among his questioners. To settle all questions of doubt he volunteered to jump one of the officer's parachutes which he had packed. The jump was successful. During the remainder of the rigger's tour of duty at this station, he was assigned to the officer whose 'chute he had used. The officer insisted on it.

Constant improvement in parachutes has developed them to the point where they may be used successfully in the most adverse circumstances. This was proved in an emergency over a year ago. A plane on patrol flight was carrying, in addition to the regular crew, several officers and civilians. The ship developed engine trouble and, after the pilot had decided the craft could not be landed safely, he gave orders

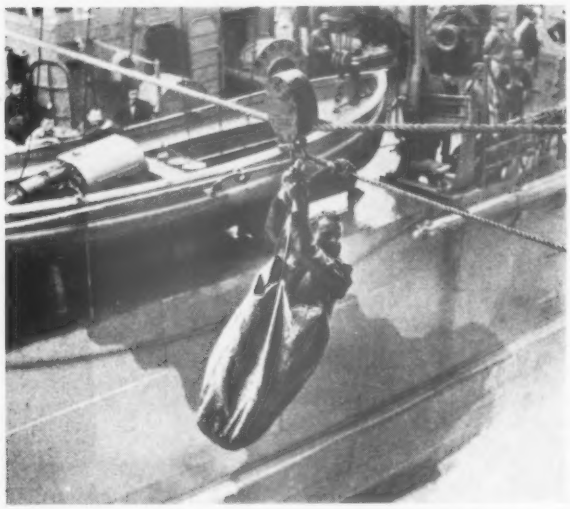
One of the requirements to be a parachute rigger in the Navy calls for the candidate's jumping in a 'chute he has packed. 'Chutes (below) get an airing.

Aviation cadets are instructed in proper handling of 'chute harness during descent.

This special litter developed for injured or unconscious survivors will give support to the body and hold the victim's face above water, pending rescue.



Side view shows complete litter equipment: face guard, life belt, first aid kits.



U. S. sailor, rescued at sea after his plane was forced down, is returned to his own ship while both vessels continue underway.

New rubber belt (right) is replacing the bulky, kapok-filled jacket (left), often referred to by wearers as a "Mae West."

to "bail out." In the excitement one of the civilians pulled the ripcord of his parachute while still in the plane. Once released, the silk billowed over the floor of the plane. One of the crew members quickly gathered up the silk canopy, tucked it in the civilian's arms and sent him out of the escape door with instructions on how to release the mass of cloth. The descent was made successfully.

The Navy has conducted extensive research in parachute equipment, not only in the material field but also in types best suited for Naval requirements. Several types, each suited for a particular purpose, are now in service. Materials and fittings entering into the fabrication of parachutes and parachute harnesses are subjected to exhaustive tests to insure that both strength and quality are maintained at a high standard. Before delivery of parachutes is accepted by the Navy, a certain number are selected at random from each lot and are attached to a dummy and dropped from an airplane in flight. This drop test simulates actual service use and provides proof that the product will function properly. This policy of rigid inspection and test—tedious and exacting as it is—has won the confidence of aviators and has paid dividends. The Navy's enviable parachute safety record substantiates this.

Safety in overwater flights once presented a serious problem to Naval aviators. Science has provided the answer to these problems. One of the most indispensable items to the aviator today is the pneumatic life jacket. Constructed of rubberized fabric, it is shaped like a vest. It contains two separate air chambers, each of which is capable of supporting a man in the water. Inflation of the jacket is accomplished by a small cylinder of carbon dioxide gas, identical to the small flasks which are used to charge water in the home. The flasks are so small they create little bulk or weight. Tubes for oral inflation also are provided for each air chamber.

All aircraft personnel are now required to wear life jackets in flights over water. The wisdom of this regulation has been proved many times.

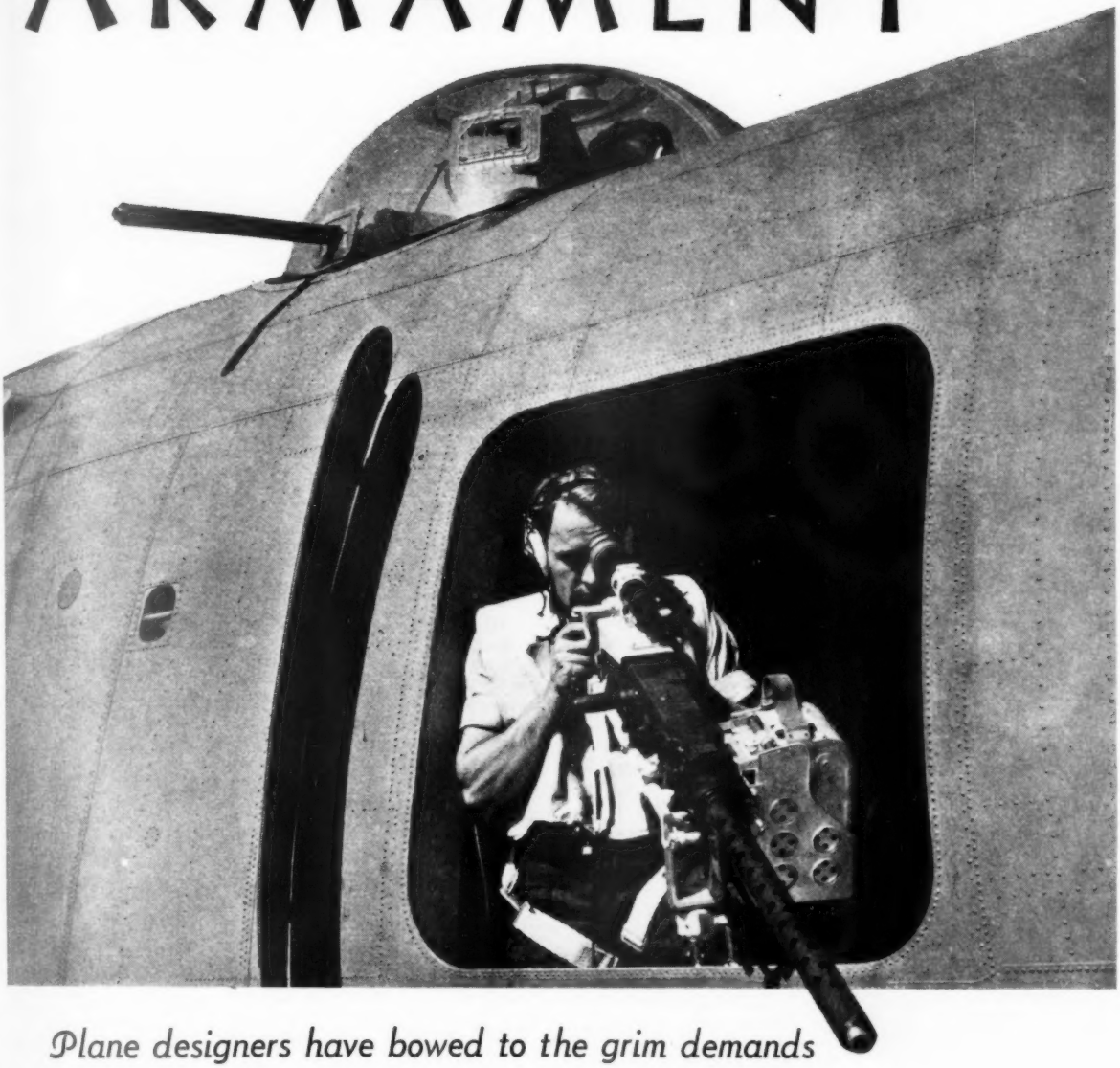
Similar in operation but on a larger scale is the pneumatic life raft carried in airplanes. This raft is manufactured from rubber covered fabric and also is inflated by carbon dioxide gas from a flash attached to the raft. Four sizes of these are built—for one, two, four or seven men.

Various types of life rafts have been developed, each of which is designed to provide adequate life saving protection based upon the performance characteristics of each type of airplane. All Naval aircraft operating over water are equipped with enough life rafts to take care of everybody on the plane.

Landplanes attached to aircraft carriers are not capable of landing on the water and remaining afloat. They can land only on carrier flight decks when operating at sea. Under combat operations, forced landings occur frequently and rafts must be available for immediate use after the plane has

(*Continued on page* 296)

ARMAMENT



Plane designers have bowed to the grim demands of war and now plan their craft around the armament.

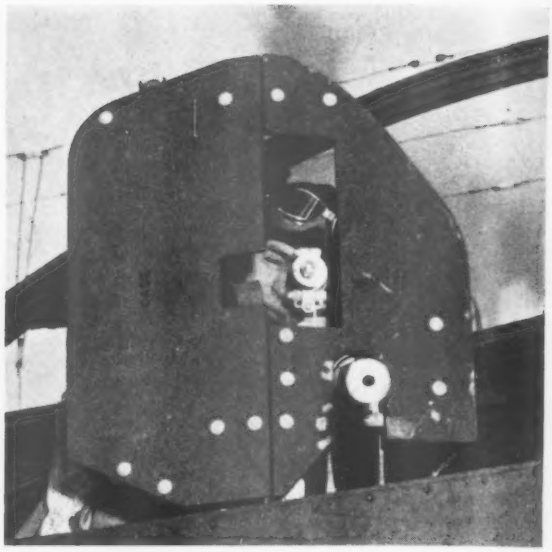
by Comm.
NORMAN
WYATT ELLIS

Born in Chicago in 1901, Commander Ellis is a graduate of the Naval Academy, class of 1924. He has been attached to many air units and, in May, 1938, he was attached to Fighter Squadron Five, based on the carrier "Yorktown." In March, 1940, he took command of the squadron. In addition to duty at Dahlgren, he took a post-graduate course in ordnance engineering.

UNTIL the last few years the question of armament—putting guns, bombs, and armor into airplanes—was one which was avoided like the plague by airplane designers. To them the airplane was merely a thing of beauty and a joy to behold. It was swift in flight and capable of climbing higher and getting places faster than the swiftest bird. To put large gun ports in the wings, to install ugly protruding turrets in the smooth aerodynamic lines, to carry huge dead-weight masses of bombs, armor and ammunition—the ideas were appalling. To them these "crimes" meant decreased speeds, altitudes and ranges—performances, in short, which fell to such an extent that their dream children were no longer recognizable. To them their original conceptions became no more than an undignified and sneered-at "crate."

To the military man, however, the airplane has always been far more than a thing of beauty. Beauty to him was, and is,

Gunner adjusts the sight of his .50 caliber machine gun in the blister of this PBY patrol bomber. A .30 caliber gun is in bow.



Heavy armor plate shields gunner as he peers through telescopic sight of .50 caliber machine gun. Position is in blister of PBY.

secondary. Since that day, long past, when a World War aviator had a brain throb and suddenly fired his pistol at an enemy plane, the military men have realized that here was a brand new weapon. The airplane, they saw, had great possibilities as a means of obtaining information about the enemy. Also, by using the guns mounted on his own airplanes similar information concerning his own forces could be denied to enemy aircraft. So guns were installed—and the aircraft armament race started.

It got under way slowly. At first the armed planes were used only for defensive purposes, as mentioned above. Then some bright lad on a reconnaissance mission thoughtfully carried along a home-made bomb and tossed it into the middle of a group of unsuspecting soldiers plodding along a road.

A detachable platform, hooked to the bottom of a wing, makes it easy for ordnancemen to inspect bomb-attaching mechanism.

Needless to say, its arrival was greeted by more than surprise —and the airplane as a major offensive weapon was born.

Unfortunately, these lessons were not too well learned. During the 20 years of peace following the first World War, aircraft development concentrated on improvements in plane performances. Armament, probably as a result of the American's inherent dislike for wars and killing, was relegated to the background. Appropriation allotments for research and development along this line were so small and experimental costs were so high that progress was very slow. Often it was necessary to cover the investigation costs of just one new and interesting invention or development by spreading them over two or more years' puny allotments.

Progress was further hampered by the basic differences in the opinions of the aerodynamic men—the "speed merchants" —and the armament engineers. The former presented the argument that for bombers, speed, speed and more speed were the three answers to the growing destructiveness of the fighter. The armament men, realizing that no airplane can be built which is faster than a fighter (unless it is another fighter), fought for more guns, accepting the slight decreases in performance which would ensue. These arguments at times grew almost bitter, for there were no means available to prove the contentions. But, happily, there were men of vision both within and without the military circles. Compromises were struck, armament stumbled slowly along, and gradually there appeared the Navy's two greatest contributions to present-day armament: the bombsight and the dive bomber.

The development of the dive bomber is dealt with elsewhere in this issue. Unfortunately, due to the secrecy surrounding the bombsight, little can be told about it. The story of its growth into the world's best—the standard for the U. S. Army Air Forces, as well as the Navy—is a story of 20 years of hardships and heartbreaks. Time and time again the final answer was thought to be at hand and time and again the elusive solution was just missed. But the small nucleus of men who had foreseen the need of such a bombsight—a bombsight which could "lay an egg in a chicken's nest" from altitudes above antiaircraft range—fought on doggedly to meet the rigid requirements and somewhat acrid comments of the testing field —the service. Gradually the bugs were worked out and its action was smoothed. The original requirements and specifications and others, more complex, which later were added, were met and the finished article was put into production. It more than met the rash promises of the designers—it became one of the most deadly weapons in use. Today it is making its mark, a mark indicated by slashes of devastation left in its wake over the seven seas and five continents.

But the bombsight alone, without something to carry it to

The rear gunner in the Douglas SBD mans one, sometimes two, .50 caliber guns in defending his plane from enemy attack.

Ordnancemen loading .50 caliber machine gun belts in SBD. Note sight tube projecting through the pilot's windshield.

its destination, is of little use. It must be taken to the target area in an airplane and that airplane must be given defenses which are adequate to carry it through enemy air and ground resistance. That means guns and armor.

It was only a short time after the first world war, when the Lewis and Vickers .30 caliber guns reigned supreme, that certain "impractical dreamers" who were never satisfied with "what we had" began to get rather fidgety about the .30 caliber gun. They could see only one thing: the .30 caliber gun would eventually be inadequate. As performance skyrocketed, space and strength would become increasingly available for armor, and since armor was installed on all other fighting machines, why shouldn't it be installed in aircraft? It remained only for them to prove that armor could be installed which could and would stop the .30. So they began to play with armor, testing its resistance against shock and bullet penetration, its effect on aircraft structures and the effect of its added weight on aircraft performance. Again they met with resistance, and progress was slow. But tenacity brought results. Armor was proved to be easily adaptable to airplanes, especially in the thicknesses necessary to defeat the .30 caliber gun.

This solution, however, introduced another problem. As has been the history of all fighting ships in the past, heavier armor has been answered by heavier guns, and heavier guns by still heavier armor. So it was with the airplane. Airplanes equipped with armor which would defeat the .30 caliber gun would get away; obviously something heavier was needed. So the armament men again took on a thankless task.

It was thankless, yes, very thankless. A heavier gun would add more weight to the airplane. Due to its larger size it would require more space for its installation: this increased space would interfere with the airplane structure and result in more weight additions. Its ammunition would be heavier and larger—adding more woes for the airplane designer. And finally, the structure necessary to withstand the terrific recoil forces when the gun was fired would have to be doubled and tripled in strength.

Naturally, the airplane designers screamed to high heaven. Up until that time they had been following a policy of building an airplane and then fitting the armament in it afterwards. With the smaller gun they had been able to do this without trouble. But a bigger gun, especially in multiple installations such as there would be in fighters, would run this practice right on to the rocks. They would no longer be able to avoid the radical changes facing them. From the day the decision was made to change to a larger gun they would have to *start* out with armament of the airplane as the basis from which they were to work; they would literally have to build the airplane around its weapons. In spite of their cries, however, the decision was made and the military airplane came of age. Its principal function, that of carrying the best possible armament installation, formed the basis of the design.

Although mathematical analyses indicated that a gun having a bore of about .6 inches—.60 caliber—is the optimum for aircraft fixed gun installations when all of the factors involved, including space and weight, are considered, the gun chosen was the .50 caliber. This gun was already proven and in production for the ground forces and could be adapted for aircraft use without too many changes. An additional factor in this choice was that the same ammunition used by the ground forces could be used in the aircraft guns.

So the "50" was chosen and designs were immediately drawn up for its installation in the airplanes. At first the designs applied only to the fixed gun installations in the fighters. Then the four-or-more gun installations found in our present day fighters were perfected.

But the armament people were not yet through bedevilling the designers. Their next step was even worse than the last. These men—most of them from the service—had realized long before that manually controlled guns, as installed in bombers, were not too conducive to accurate shooting when handled by a gunner who must jump around while firing. A gunner was often upon the most unsure footing due to the airplane's maneuvering and to bumpy air. When these conditions prevailed the guns would probably be the cause of many lost airplanes—of their own forces. They realized the blunt fact that hits could be obtained by these gunners only at ranges which were well within the range at which fighters, shooting from a much steadier platform, would be getting lethal hits. This condition existed to some extent with the .30 caliber guns—although there were many who denied it—but it was brought forcefully to the front by the choice of the "50." This gun, because of its size and weight, could be handled by a gunner only within very limited angles and its accuracy of fire would be wasted by the inability of the gunner to bring it to bear on the target. The answer to the problem was found in the power-operated turret, a piece of equipment which held the gun steady throughout all sorts of maneuvers and rough air and which could bring the guns to bear at angles never before reached by manually-operated guns.

The installation of turrets in aircraft was at first, under the proddings of the speed merchants, held only to the larger bombers. But as performances continued to zoom upwards, and experience in the design of the turrets was gained, this

(*Continued on page* 256)

The Battles

(Continued from page 76)

safely landed aboard the *Yorktown*.

27 airplanes lost in combat or by antiaircraft fire.

The "Wasp" at Malta

While the Battle of the Coral Sea was at its height, another Navy aircraft carrier, over on the other side of the world, was lending aid to our allies on the beleaguered island of Malta.

Under the merciless bombing of raid after German raid, Malta's supply of intercepting fighters had run dangerously low. Other raids were impending and the island had to be provided with new fighters at all cost.

To get them there, the U. S. Navy's carrier *Wasp* took aboard a load of British *Spitfires* and joined up with a British carrier and an escorting force. On the night of May 7 this group steamed silently through the straits of Gibraltar and proceeded to a point well within the range of the *Spitfires* to Malta.

Early on the morning of the 8th the first *Spitfire* roared off the flight deck of the *Wasp*. Before eight o'clock several squadrons of England's finest fighters, accompanied by many more from the British carrier, had left their temporary American home.

The *Wasp* returned to her station without incident.

Midway

The first week in June found the Japanese launching a tremendous two-pronged thrust at United States territory. The southernmost prong consisted of a powerful striking force, support force and occupation force aimed at Midway Island, and probably Hawaii. The successful interception of these forces by aircraft of the Navy, Army and Marine Corps constituted the epic Battle of Midway, which may well prove to have been the most decisive conflict of our war with the Japanese.

First contact with the enemy came on the morning of June 3, when a Navy Consolidated *Catalina* patrol plane reported two Japanese cargo vessels 470 miles off Midway. A few minutes later another plane reported a large part of the enemy fleet some 700 miles distant. A flight of Army *Flying Fortresses*, led by Lieutenant Colonel Sweeney, roared down the Midway runway and out to meet the enemy. That afternoon they hit a battleship and a transport with high-altitude bombing.

Late that night Lieut. W. L. Richards led four *Catalinas* on a moonlight torpedo raid. A formation of Japanese transports was discovered more than 500 miles from Midway. Making an up-moon approach, the four *Catalinas* came in low and scored two direct torpedo hits.

Next morning the *Flying Fortresses* took off again in search of the enemy warships, and the other defenders of Midway got set for the expected Japanese air raid.

At 6:35 a.m. it came. Three groups of nine high-altitude bombers, followed by a second wave, attacked the ground installations on the island. They were met by a hail of anti-aircraft fire and hard-fighting Marine Corps pilots in Grumman *Wildcats* and Brewster *Buffaloes*.

At nine o'clock Lieutenant Colonel Sweeney reported that his *Flying Fortresses* had damaged an enemy carrier. At 9:30 word came that the Grumman *Avengers* (TBF-1) and Army Martin *Martians* (B-26), launched earlier from Midway, had dropped their torpedoes at carriers. A little later the Marine dive bomber group reported two hits on an enemy carrier and one on a battleship with their *Vindicators* (SB2U). Still later, other Army *Flying Fortresses* sent word of hits on a burning carrier and on a cruiser.

During the next two days, the *Flying Fortresses* went out again, and the Marines scored a dive bombing hit on a damaged enemy cruiser.

In the four days of action at Midway, 56 Japanese airplanes were destroyed and 14 damaged by the Marine Air Group and the Sixth Defense Battalion antiaircraft gunners. The Marines scored two hits on an enemy carrier and one on a cruiser. The Navy's night patrol plane attack scored two torpedo hits on enemy transports. The Army *Flying Fortresses* hit two carriers, two battleships, a heavy cruiser and a transport.

Thirty-eight of our airplanes based at Midway were lost in action.

While the land-based defenders of Midway were fighting so gallantly, far out at sea our aircraft carriers were making history.

Following the battle, Capt. G. D. Murray, commanding officer of one carrier, said, "Your air groups, both pilots and gunners, displayed a spirit of fearlessness, resolution and determination throughout all action. This spirit, though shared by pilots and gunners alike, found its highest expression in the person of the Air Group Commander, Lieut. Comm. C. W. McCluskey, Jr., U.S.N."

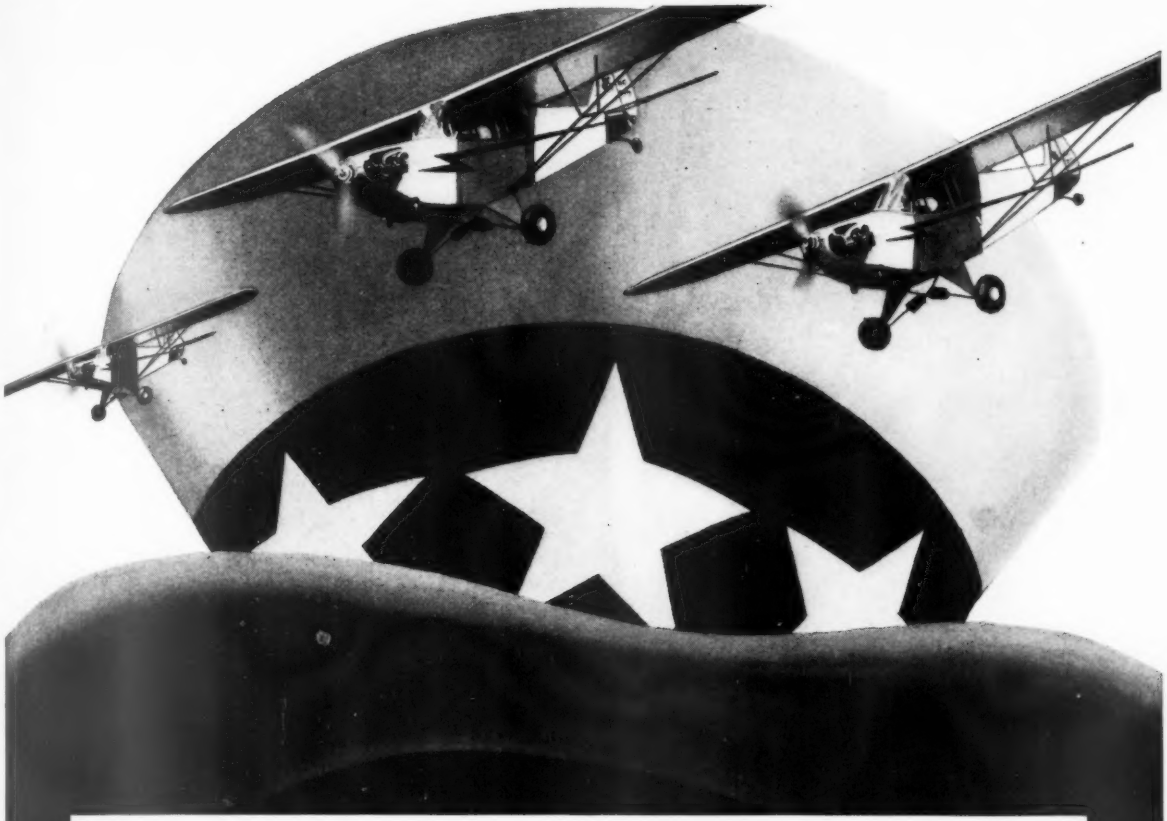
Lieutenant Commander McCluskey's air group was made up of Douglas *Dauntless* dive bombers, *Devastator* torpedo bombers and Grumman *Wildcat* fighters from squadrons led by Lieut. R. H. Best, Lieut. W. E. Gallaher, Lieut. Comm. E. E. Lindsey, and Lieut. L. H. Bauer. These squadrons made four attacks on the enemy fleet, with far-reaching results.

At noon on June 4, the *Dauntlesses* from the bombing and scouting squadrons made contact with a powerful enemy force consisting of four aircraft carriers, two battleships, four cruisers and six destroyers. Lieutenant Commander McCluskey and one group attacked the carrier *Kaga* while another group concentrated on the carrier *Akagi*. At least eight direct hits were made on the first carrier. The smoke from resulting fires made an accurate count impossible. At least three hits were scored on the second carrier which began to flame and smoke. The second division of the second group dove on the first carrier and registered hits with 1,000-pound bombs. The third division divided its attack between two carriers. Three carriers in all were left with raging flames and mountainous clouds of smoke filling the horizon.

Enemy antiaircraft fire and Zero and

(Continued on page 199)

Our Navy antiaircraft gunners accounted for at least 28 of the 100 planes taking part in the attack on Pearl Harbor. The bomber below is starting its death dive.



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23 YEARS AGO FIRESTONE

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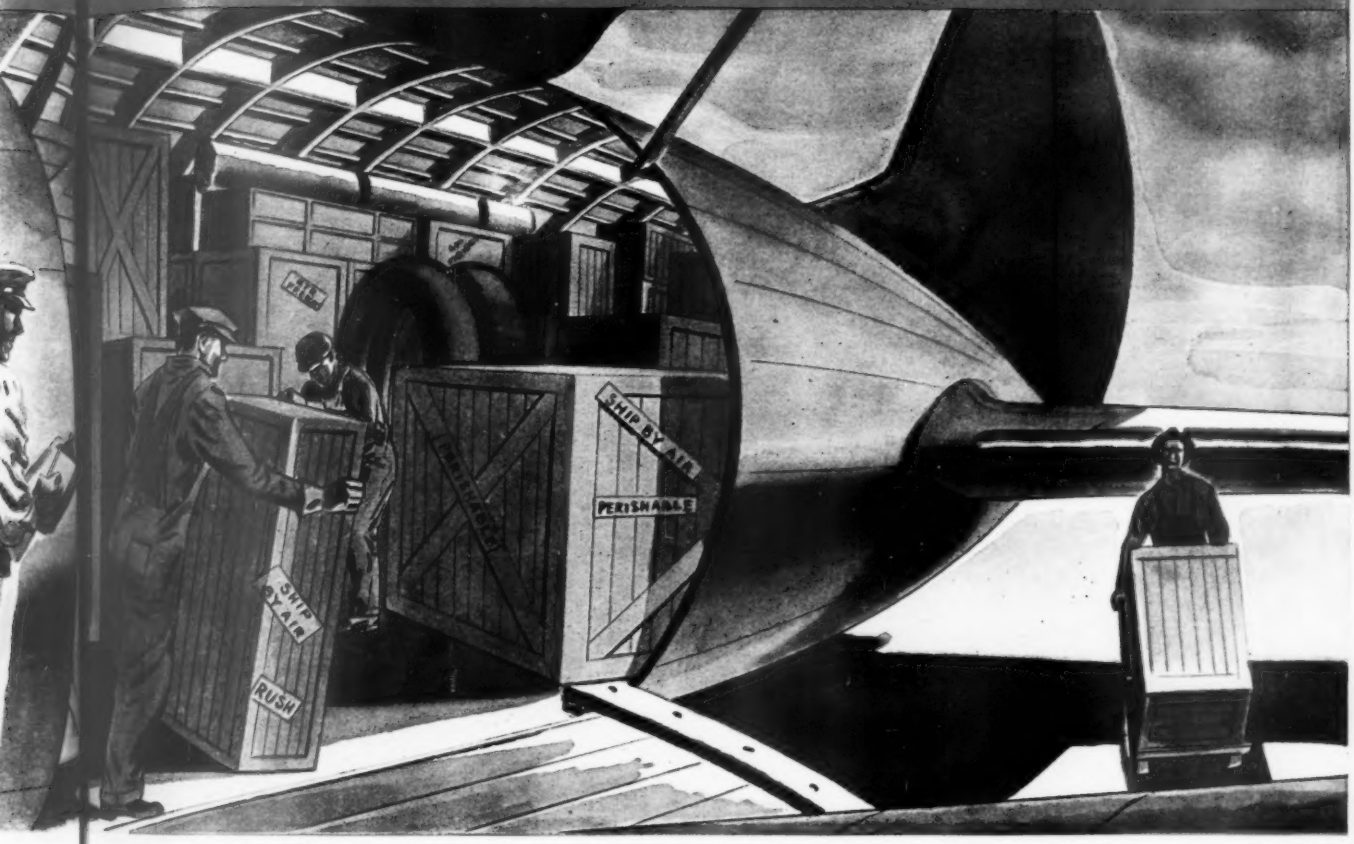
For example, giant air freighters will fly

THE FOURTH DIMENSION

PIONEERED "SHIP BY TRUCK"

PIONEERS "SHIP BY AIR"



TOMORROW . . . IN PEACETIME

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IN TRANSPORTATION ★ ★

OFFICIAL U. S. NAVY PHOTOGRAPH

ALL-AMERICAN TEAMWORK – 1943

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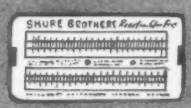

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Aircooled Motors Corporation is proud to think that many of them, from their earliest training, will learn to trust the power and dependability of Franklin engines.

Franklin's 43 years of air-cooled engine building experience have made these engines the choice of practically all light plane manufacturers. Looking toward the future, Franklins already have powered several of the most promising new planes, including the amazing Sikorsky helicopter and [redacted].

Yes, these boys and girls can count on Franklin to build ever-finer engines for tomorrow's finer planes.

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"IT'S LIGHT—Not an ounce of useless weight about it. That means the Aeroprop delivers maximum horsepower and fight-power per pound."

"IT'S STRONG—And you can bet that strength pays off in safety and longer fighting service."

"IT'S SIMPLIFIED—Unit-construction puts automatic pitch control, plus the power for pitch changes, right in the compact propeller assembly itself."

Many a pilot on many a front could tell a better story of the Aeroprop than we can.

They've pulled the trigger on the deadly gun that pokes its barrel through the Aeroprop's hollow hub.

They're flying every day, and sometimes every night, so they praise the strength and durability of this steel propeller.

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"Everything but talk!" The Aeroprop will never need to talk where ACTION speaks louder than words—where there are pilots who have flown with it, fought with it, and conquered with it.

AEROPROP

AEROPRODUCTS DIVISION **GENERAL MOTORS** CORPORATION

GM ARMS FOR VICTORY

(*Continued from page* 192)

Messerschmitt fighters concentrated on our dive bombers during their retirement. Eighteen failed to return, although six pilots and five gunners of this number were later recovered.

It was during this action that Lieutenant Commander Lindsey and nine other torpedo plane pilots were lost. They pressed their attack home on this group of enemy carriers, and concentrated especially on the *Kaga* in the face of concentrated fire from all types of surface ships and despite the attacks of nearly 25 Zero fighters.

The second sortie by this air group was made on the afternoon of the same day. Seventeen of its dive bombers, reenforced by seven from the *Yorktown*, dove out of the sun on the carrier *Soryu* and an unidentified Japanese battleship. Six direct hits were observed on the carrier and two on the battleship. The carrier was set afire from bow to stern. Three dive bombers were lost in this engagement.

On June 5 a third attack was launched and a light cruiser was bombed with unobserved results.

The air group's fourth attack the next day registered five direct hits on a cruiser of the *Mogami* class, and hits on another cruiser. The *Mogami* class cruiser was left dead in the water and emitting heavy black smoke. Six accompanying fighters strafed two destroyers at point blank range.

During the entire daylight period of the battle, fighting squadrons maintained a combat air patrol over our forces. On one day alone, one squadron shot down nine Japanese airplanes.

On June 4, Torpedo Squadron Eight was launched to participate in the attack on the enemy carriers. Gallantly led by Lieut. Comm. John C. Waldron, this squadron was lost in its entirety except for Ens. G. H. Gay, whose "fishes' eye view" of the action became a famous story. Personnel of VT-8 were recommended to the Board of Awards "For conspicuous gallantry and exceptionally distinguished service in gallantly delivering a torpedo attack against the enemy . . . for driving home an effective attack against a terrific hail of antiaircraft fire and a murderous assault of many Japanese fighter planes, far above and beyond the dictates of duty." Pilots were awarded the Navy Cross; enlisted gunners the Distinguished Flying Cross.

The same formation of four enemy carriers attacked by VT-8 on June 4 was also attacked by the *Yorktown* air group. Lieut. Comm. Oscar Pederson was air group commander aboard the *Yorktown*. His group was made up of squadrons under Lieut. Comm. J. S. Thach, Lieut. Comm. L. E. Massey, Lieut. Comm. M. F. Leslie, and Lieut. W. C. Short.

This group also arrived over the enemy force about noon. The torpedo planes were heavily attacked during their approach. Seven members of this group, including Lieutenant Commander Massey, were lost before their attack, and three afterwards. In the face of heavy fighter opposition and antiaircraft fire, the torpedo planes scored three hits on one carrier and one on another.

The dive bombers began their dive from 14,000 feet, maintaining a steady aim on the *Soryu*. They continued down through a ring of gunfire and made six direct hits. Two dive bombers saw that the carrier was doomed to sink and diverted their attack to a cruiser, scoring a direct hit. Two others likewise shifted to a battleship and left it smoking. The carrier was an inferno. All the dive bombers departed safely.

As these dive bombers were about to land back aboard the *Yorktown*, a force of 17 Japanese bombers protected by 18 fighters came in to attack. Our dive bombers and fighters were ordered to intercept. Seven of the enemy got through our combat patrol and the *Yorktown* was badly damaged by bomb hits from three of them. All *Yorktown* aircraft were ordered to land on another carrier.

An hour and a half later a formation of Japanese torpedo planes resumed the attack on the *Yorktown*. All but one of these were shot down by our fighters or by the *Yorktown's* antiaircraft fire. One torpedo, however, struck the ship and all power was lost. She began to list and "abandon ship" was ordered.

Next day a salvage party, led by her commanding officer, boarded her. Work was progressing satisfactorily when a salvo of torpedoes hit the *Yorktown* and the *U.S.S. Hamann*, her escort. The *Hamann* was lost and the next morning the *Yorktown* sank with all her battle flags flying. During her career she sank three cruisers, three destroyers, five auxiliaries and played a leading part in sinking four carriers.

Her airplanes continued the fight.

Following the loss of VT-8, a fighting squadron from the same carrier joined the fight above the *Yorktown*. Three Zeros and two dive bombers fell before their guns. This carrier then launched a second attack group with a resulting three hits on a battleship and two on a heavy cruiser.

On the morning of June 6 this group scored again, this time with three hits on a battleship, two on a heavy cruiser and one on a destroyer. All planes but one returned from this attack.

In the afternoon the same carrier's scout bombers drove home the last attack of the battle. Six hits were made on a light cruiser; one on a destroyer. A heavy cruiser was struck with a 1,000-pound bomb and left completely gutted by fire, with personnel abandoning ship.

Lieutenant Commander Thach's squadron accounted for 25 enemy airplanes shot down and 15 probably shot down. Lieutenant Commander Thach shot down three fighters and a torpedo plane. Lieut. (jg) A. J. Brassfield got four bombers and probably two more. Lieut. (jg) E. S. McCuskey got three bombers, two fighters and probably three more bombers. Machinist D. C. Barnes shot down two torpedo planes and probably two fighters.

Enemy losses were as follows:

4 aircraft carriers sunk: the *Kaga*, *Akagi*, *Hiryu* and *Soryu*.

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2 heavy cruisers sunk.
3, possibly 4, destroyers sunk.
2, probably 3, battleships damaged.
3 heavy cruisers damaged.
1 light cruiser damaged.
4 transports and one cargo ship hit, and one or more possibly sunk.
4,800 estimated personnel loss.
275 airplanes shot down or sunk with carriers.

Our losses were as follows:

1 aircraft carrier, the *Yorktown*, sunk.
150 airplanes lost or damaged beyond repair.
92 officers and 215 men.

The Aleutians

As one prong of the Japanese force struck at Midway, the other headed northeastward where our defenses were not so strongly bulwarked. The enemy thrust at the Aleutians met with more success.

Part of this success certainly was due to the weather. For days before the Japanese struck at Dutch Harber, the Navy's Consolidated *Catalinas* searched for their oncoming forces with but meager results. Under cover of fog and low-lying cloud banks, the enemy steamed toward our positions with his main units unobserved in spite of the most vigorous and extensive searches. Despite this fact a warm reception greeted the two enemy raids on Dutch Harbor on the 3rd and 5th of June. Little damage was done to our establishment there.

Attempts to locate the main force of the enemy were continuously pressed by both the Navy's *Catalinas* and the Army's *Flying Fortresses*. On the afternoon of June 19, a *Catalina* pilot located the first sign of the enemy landing at Kiska and Attu. On the way back he bombed a light cruiser and a destroyer.

By this time reinforcements of *Catalinas* from two patrol squadrons had been ordered from San Diego and other bases. They proceeded with the utmost speed, and one patrol squadron was making bombing runs on Kiska on the fourth day after their departure from San Diego.

Catalinas made numerous bombing attacks on cruisers, destroyers and submarines and, on June 12, the bombing of Kiska began in earnest. For the next 48 hours every plane available to one patrol wing shuttled almost continuously from Dutch Harbor to Kiska, dropped its bombs and returned for more. Army *Flying Fortresses* assisted in these raids which were kept up day and night. The pilots of the *Catalinas* dove down through the overcast at Kiska like dive bombers, released their bombs and then often made four-handed pull-outs on the controls to get back into the overcast. Ground crews worked round the clock without rest to keep the flying boats in service. One pilot flew 193¾ hours out of 24. Another flew 178 hours in 18 days. The entire crew of a seaplane tender worked 36 hours without sleep. Bombs by the score were dropped on enemy warships, transports and shore installations.

Following these heavy raids on Kiska, the patrol wing settled down to a grueling routine of search flights, during which tens of thousands of miles were flown in preparation for the landing of Army troops in the Andreanofs.

During the movement of troops to their new positions early in August, the wing acted as a close screening force for our transports. It has continued to co-operate with the growing Army force of bombers and fighters in the efforts to blast the enemy from the Aleutian chain.

Reconnaissance photo at Guadalcanal, taken before strategic island was captured by our forces, helped U.S. offensive. U-shaped revetments shielded Japs from strafing.

The Solomons

During the early morning of August 7 the Navy, in a surprise move, struck swiftly at the Jap-held Solomon Islands. Under cover of a heavy overcast and protected by carrier-based aircraft and supporting fire from surface vessels, an amphibious force of Marines landed and established several beachheads. So complete was the surprise that 18 Japanese seaplanes and a schooner were caught in a harbor of the Guadalcanal-Tulagi area and sunk. By nightfall this operation—which was under the general direction of Adm. Chester W. Nimitz, Commander in Chief of the Pacific Fleet—had progressed to the point where our troops had captured most of Tulagi, all of Gavutu, had occupied a position at Halavo on Florida Island, and had taken a strong beachhead in the Tenaru River region of Guadalcanal.

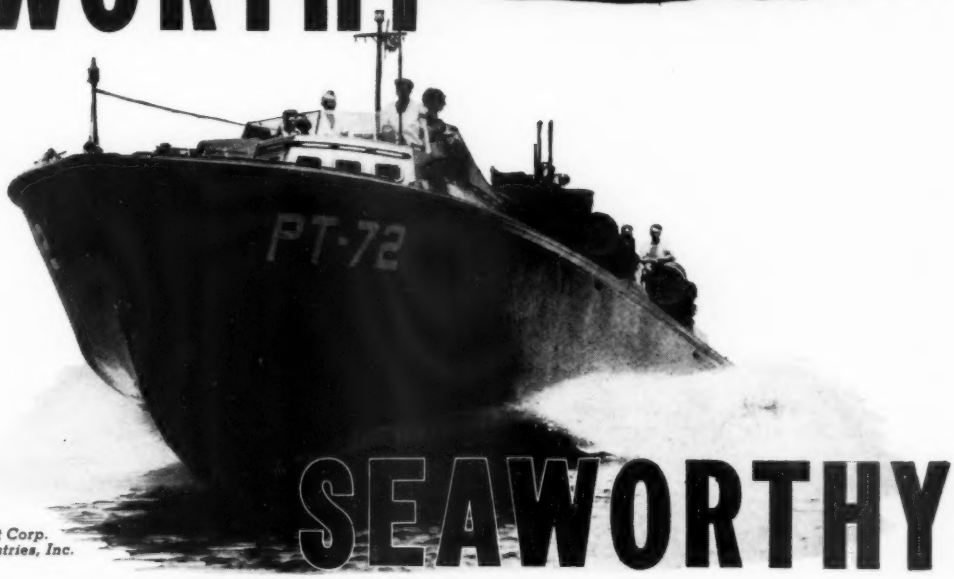
The first enemy counterattack developed at about 3:20 p.m. on August 7 when 25 heavy bombers attacked the occupying forces. No hits were scored, but antiaircraft fire from our surface ships brought down two bombers and damaged two more. At about noon on August 8 at least 40 Jap torpedo planes came in to attack our ships in the harbor. One destroyer and one unloaded transport were hit. Twelve enemy planes were shot down by our fighter planes and antiaircraft and two were destroyed by gunfire from shore batteries. During the enemy air attacks on August 7 and 8 our carrier-based planes and antiaircraft batteries shot down 47 Jap planes of different types. Besides, our carrier aircraft dive bombed a number of enemy shore batteries and supply centers.

By noon of August 10 the Marines had overcome all major opposition on Guadalcanal, Tulagi, Gavutu, Tanambogo, Makambo and parts of Florida Island and had begun "mopping up" operations.

Since our first landing in the Solomons on August 7 the fighting has continued, with the Japanese strength in the region gradually being dissipated. During the night of October 5-6, for example, Navy and Marine Corps dive bombers and torpedo planes from Guadalcanal attacked six enemy destroyers which had been located by our search planes. The ships were attempting to assist enemy landing operations at the northwestern end of the island. One destroyer was sunk and another damaged. When the Japs continued reinforcement operations, Navy and Marine dive bombers on October 8 attacked an enemy surface force northwest of Guadalcanal. The force included a cruiser and five destroyers. The cruiser was hit by a torpedo and bombs. During the air battle which followed four enemy seaplanes were shot down. Two of our planes were lost.

In the early part of November our air reconnaissance revealed a heavy concentration of Jap transports, cargo ships and combatant units in the New Britain-Northwestern Solomons region. On November 10 it became evident that the expedition, an all-out attempt by the Japs to retake the Solomons, was being launched in force. Other Jap detach-

AIRWORTHY



SEAWORTHY

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WHITHER THOU GOEST BROTHER!

I'll be right on your tail — from Tunis to New Guinea. All of us have learned one thing in a year of war — you play for keeps, you kill the Jap or Nazi before he kills you. But the best pilot in the world is useless unless he gets the ships to fly and the guns to shoot. That's where the folks at home come in. What are you doing about us?

THE HUMAN FACTOR . . .

The results show that the American Aircraft industry is producing pursuit and interceptor planes equal if not superior to any in the world. Curtis, Bell, Republic, Lockheed, Gruman and the other organizations are responsible but it is the human factor — the ingenuity, the patriotism, and the skill of the designers, the sheetmetal workers, the mechanics — that make it possible. To these workers — the men and women who build our pursuits and interceptors, we owe a great debt of gratitude.

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ments moved southeastward toward Guadalcanal from Rabaul and Buin. Among U. S. units which went to intercept them were many Army bombers from Gen. Douglas MacArthur's command.

The spearhead of the Jap attack included, as nearly as could be estimated at the time, two battleships of the *Kongo* class, two heavy cruisers, four light cruisers, and about 10 destroyers. This unit reached the Guadalcanal area shortly after midnight on the morning of November 13, intending to bombard our shore positions and prepare for a large landing from transports. The force, formed into three groups, was engaged by units of our Fleet and a close-range battle developed, the first such battle of the war. In a furious night engagement the Japs appeared to grow confused; during the latter part of it the three Jap groups were firing at one another. Shortly thereafter the Japs withdrew from the battle and retired hastily northward.

During the next day our aircraft made continuous attacks on damaged enemy ships that remained in the area. A Jap transport force that was intercepted heading for Guadalcanal from Bougainville was struck heavily by our air forces. At least eight of the transports were sunk. The rest of them continued toward Guadalcanal. During the night of November 14-15 Navy surface forces engaged Jap surface units in the Guadalcanal area. On the morning of the 15th, four Jap transports were found beached and were attacked by air, artillery and Naval gun fire. They were destroyed. That same day our patrol aircraft reported the Japanese forces again withdrawing to the northward, once more frustrated completely in a large-scale attempt to smash our growing power in the Pacific.

During the November actions mentioned above the Japs suffered the following losses:

1 battleship sunk.
3 heavy cruisers sunk.
2 light cruisers sunk.
5 destroyers sunk.
8 transports sunk.
1 battleship damaged.
6 destroyers damaged.
4 cargo transports destroyed.

Our losses were:

2 light cruisers sunk.
6 destroyers sunk.

Among our casualties was Rear Adm. Daniel J. Callaghan, killed in one of the night actions.

Total Japanese losses announced by Navy Department Communiques No. 1 to 194, which cover the entire war through November 16, are as follows:

(Some of the losses listed below were inflicted by Marine Corps and Army forces.)

	Sunk	Probably Sunk	Damaged	Totals
COMBATANT SHIPS				
Battleships	1	0	8	9
Aircraft Carriers	6	1	7	14
Cruisers	18	3	41	62
Destroyers	38	12	31	81
Submarines	6	1	6	13
Tenders	1	1	5	7
Others	16	2	14	32
Totals	86	20	112	218
NON-COMBATANT SHIPS				
Fleet Tankers	14	0	8	22
Transports	36	7	19	62
Cargo and Supply	65	7	22	94
Miscellaneous	7	2	8	17
Totals	122	16	57	195
Total ships of all types	208	36	169	413

END

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A NEW yard air mail system to facilitate the delivery of yard mail to auxiliary base fields was inaugurated on a trial basis at the Naval Air Station, Pensacola, Fla.

The mail plane will make three regularly scheduled trips a day. During inclement weather yard mail will be delivered to and collected from the outlying fields by truck.

School must wait! Uncle Sam's call for all-out service has upset many plans . . . deferred many hopes, but, for America's young men and women, their dreams are well *worth waiting for!*

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Your new *Victory Model* CULVER . . . a more efficient, finer, cross-country airplane . . . is being delayed while we build planes for the U. S. Army and Navy, but it will be available to you and all our teen-age boys going to war when today's important job is finished and you'll find that it, too, is well worth waiting for!

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CULVER AIRPORT · LET'S GO! U.S.A. · KEEP 'EM FLYING! · WICHITA, KANSAS

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Zero hour for ZEROS

Off heaving flight decks and bomb-scarred fields, from Wake to Guadalcanal . . . United States Navy and Marine pilots in Grumman Wildcats are fighting through hostile skies to victory.

It's just *too* bad for Tojo when one of our lads gets a bead on a Zero. American courage, American skill plus a ship like the Wildcat is more than a match for the best the Jap has to offer!

Years of experience designing and building planes for specific services give Grumman aircraft what it takes to *come through*. For war today... and peace tomorrow ... look to Grumman to set the pace.

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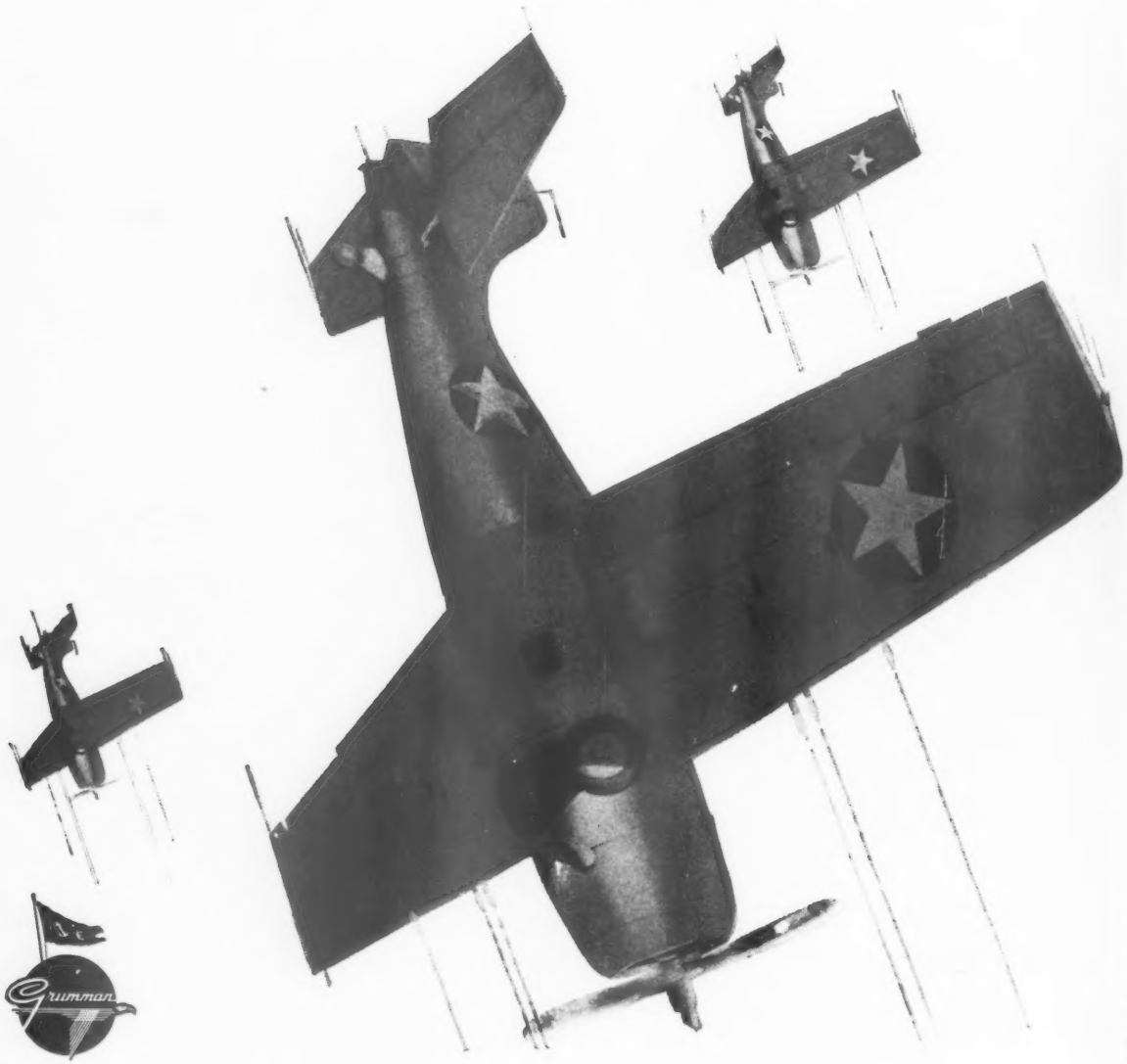

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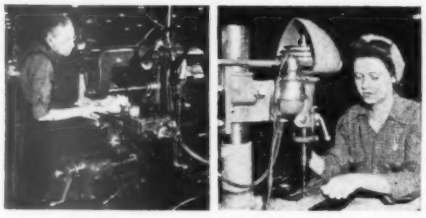


"—it ain't the individual nor the army as a whole, but the everlastin' teamwork of every bloomin' soul!"
Rudyard Kipling

"You build 'em, we'll fly 'em" says the Navy—and **Rohr** production fighters accept the challenge to maintain at peak output their highly specialized jobs of precision parts manufacture and vital assemblies!

HELPING TO WRITE THE STORY OF TOMORROW

Rohr Aircraft Corporation, Chula Vista, California

The Enemy

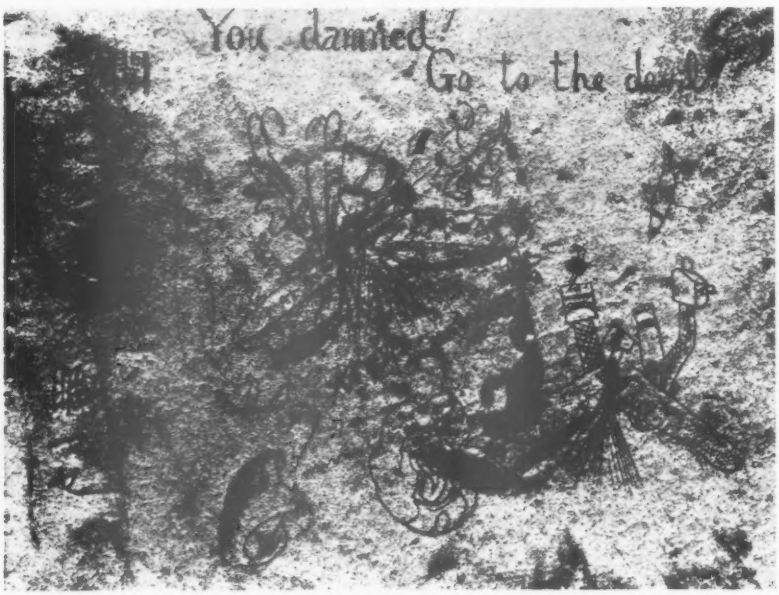
(*Continued from page* 102)

and, with good-natured American abandon, knocked baseballs all over Japan. It was murder, and the Japanese expressed bitter disappointment. For several years thereafter they continued to play baseball with American teams, but with reduced ambitions; they worked down through the professionals to the college teams and, before the hostilities commenced, were getting around to the high school and sandlot groups.

The marksmanship of the average Japanese flyer is poor. That is one of his main weaknesses. Japanese marksmanship generally is inferior; this applies not only to Jap fighter pilots firing machine guns and cannon and to bombardiers but also to antiaircraft gunners and ground troops. In reports of flyers in the Battle of Midway are found such statements as this: "In connection with the performance of the Zero fighter, any success we have had against the Zero is . . . the result of comparatively poor marksmanship on the part of the Japanese, stupid mistakes made by a few of their pilots and superior marksmanship and teamwork on the part of some of our pilots."

It has become a cliché to say that the Japanese are imitative, that they have derived all their force from copying foreign ideas and equipment. This, we have learned, is not altogether true, but it is curious that although the Jap flyer entered the war with the neat advantage of fighting experience gained in China and elsewhere, he altered and improved his tactics after the start of the battles in the Pacific by observing tactics our flyers had worked out during peacetime.

The Japanese genius for copying has, on occasion, back-fired. Several years ago a firm of Scottish shipbuilders was having trouble collecting some bills from the Jap government. Conditions got so bad that the firm, then being engaged in drawing up plans for a Jap battleship, decided to fight fire with fire. The Scotchmen accordingly sent the Japs plans for a new ship that would have turned out to be a wonder, with a couple of minor flaws, one being that its center of gravity was so low it wouldn't float. The Japanese were delighted with the plans but decided it would be better to get them for nothing. So they took photostats and returned the plans with a notation that they were unacceptable. Then they went ahead and built the ship. When the day came for the launching, a good-sized crowd turned out. Somebody broke a bottle of champagne over the prow and the new battleship started on its way. It got up a rattling good speed which, as far as is known, never slackened until it hit the bottom. The Japs all went home, agreeing that it had been a most unsatisfactory launching.



Childish scribbling marked this pamphlet, found in a Jap plane after Pearl Harbor attack. More serious was the presence of pseudo Philippine money, "Made in Japan."

Since the start of the war, the Japanese have not copied our fighter planes. However, there has been little disagreement among Navy flyers on whether the protective armor of the Grumman F4F should be sacrificed to give the plane the almost vertical climbing power of the Zero. "Anybody who has seen a fighter go down in flames," one pilot has said, "would insist on keeping the armor and protected gas tanks." The bulletproof windshield of the Grumman has demonstrated its effectiveness on several occasions. In one instance, a .25 caliber machine gun bullet struck one directly and damaged it only slightly, leaving a small starred area.

It may be difficult for us to match the maneuverability of the Jap fighter plane. Its superiority in this respect is related to the physical character of the men who fly it. The average Jap pilot weighs perhaps 125 pounds, as against the 165 or so of the American. It follows that the weight of the Zero itself can be proportionately less. However, the superior fighting qualities of the Zeros do not stem altogether from the diminutive size of the men who fly them. The Japanese equipment of all kinds is the result of years of painstaking research. The Zero fighters (contrary to the popular notion that there are several types) have been skillfully designed for weight saving and streamlining. They are so hard to match in dogfighting that AVG pilots flying Curtiss P-40's in China found that the best tactic against them was to make one pass, blasting them with .50 caliber machine guns, and then get out of the way. The plane Navy pilots call the "Nagoya Zero," the latest model, is faster, longer, thinner, and higher-powered than its predecessors, some of which were, however, more maneuverable. All the types have a few pronounced defects—among other things, they have an inferior cooling system, they dive poorly and their brakes are unreliable. Army fighters flying P-40's in China and Navy fighters flying Grummans have often been able to circumvent the Japs' highly maneuverable attack by diving away from them.

The framework of the Zeros is made of steel and aluminum tubing similar to that used in American planes. The overall length of one Zero plane now in American possession is 29 ft. 8 in. and its wing span is 39 ft. 6 in. The wings are hinged two feet from the tips to allow folding for easier carrier handling. It is a stable plane, easy to fly. Its top speed is better then 320 m.p.h. Around 200 m.p.h. the Zeros are very light on the controls, but at higher speeds the controls become stiff. Above 225 m.p.h. they are too stiff to allow a fast roll. A Zero that was shot down and salvaged developed a marked vibration and flutter in diving at a high speed, which may account for the fact that the Japs seem reluctant to dive them. Flying Tigers returned from China have reported that the long wing spars of the Zeros they encountered, which should have been especially strong, were, in fact, weak. In some cases they were cut partially through to permit mounting wing machine guns, and apparently pulled off under a moderate strain. The cockpits of some of the shot-down Zeros are so tiny they indicate the Japs are using their smallest available men for pilots. Americans have had difficulty getting into some of them. The average weight of the Zero is several thousand pounds less than that of our fighters. It has a 900-plus h.p. radial engine of 14 cylinders and uses a modification of many features found in our air-cooled engines. Its propeller is a three-bladed, constant speed, hydraulic type identical to the Hamilton

(*Continued on page* 219)

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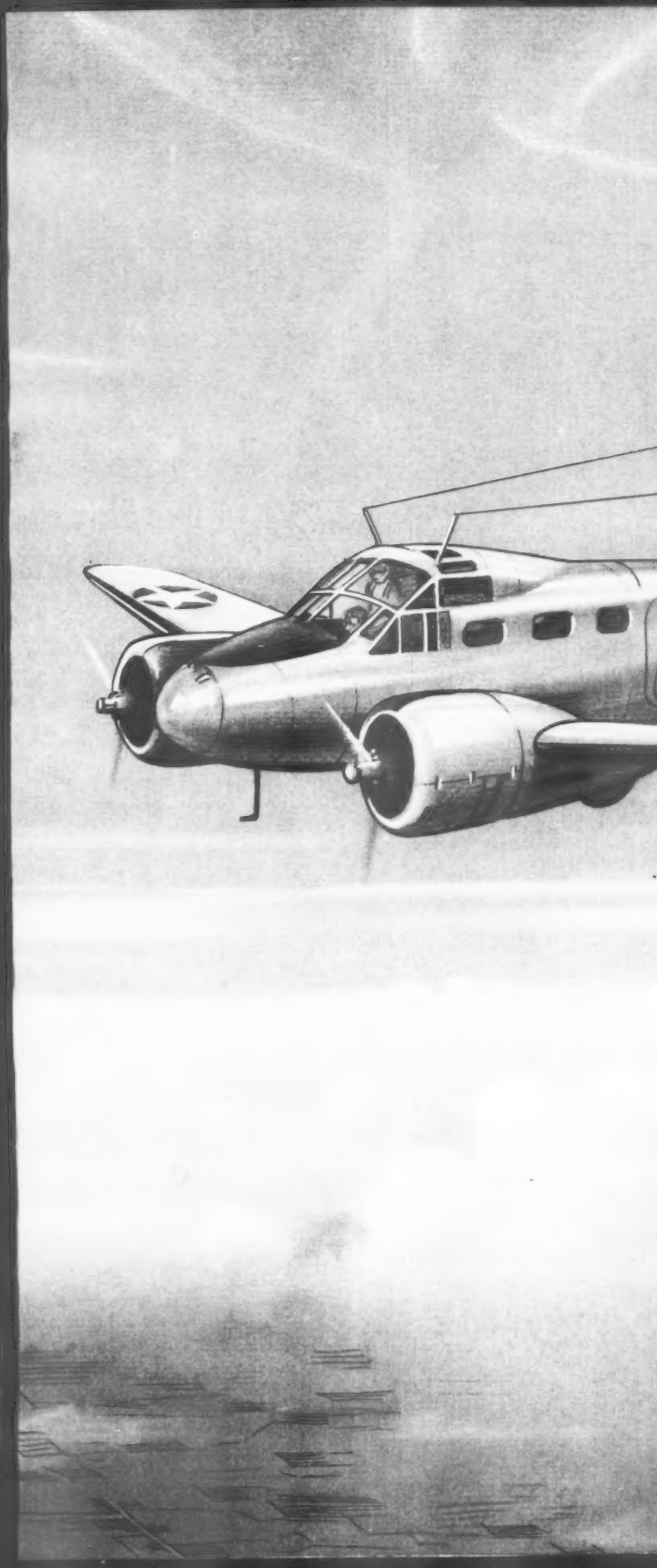

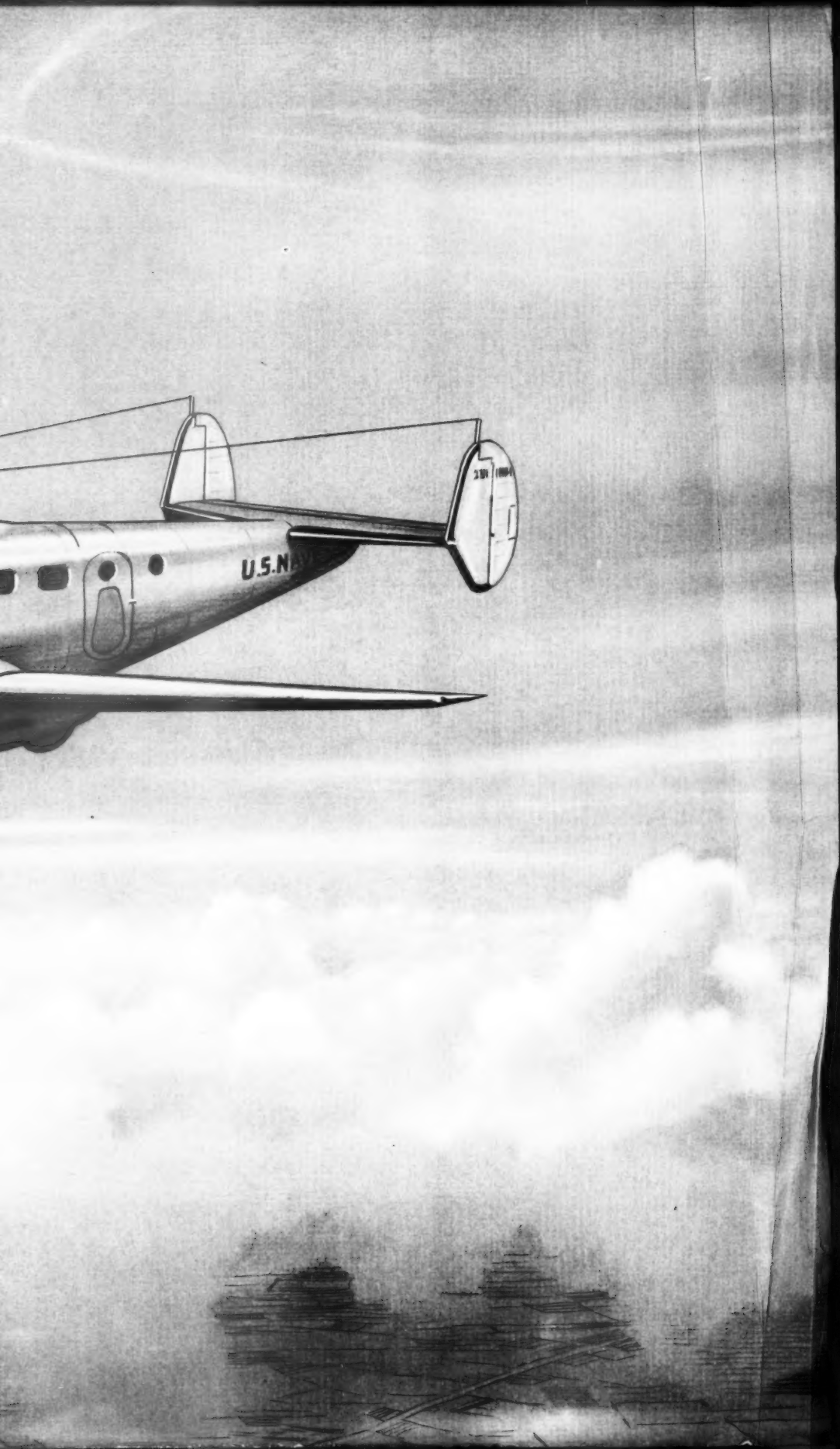
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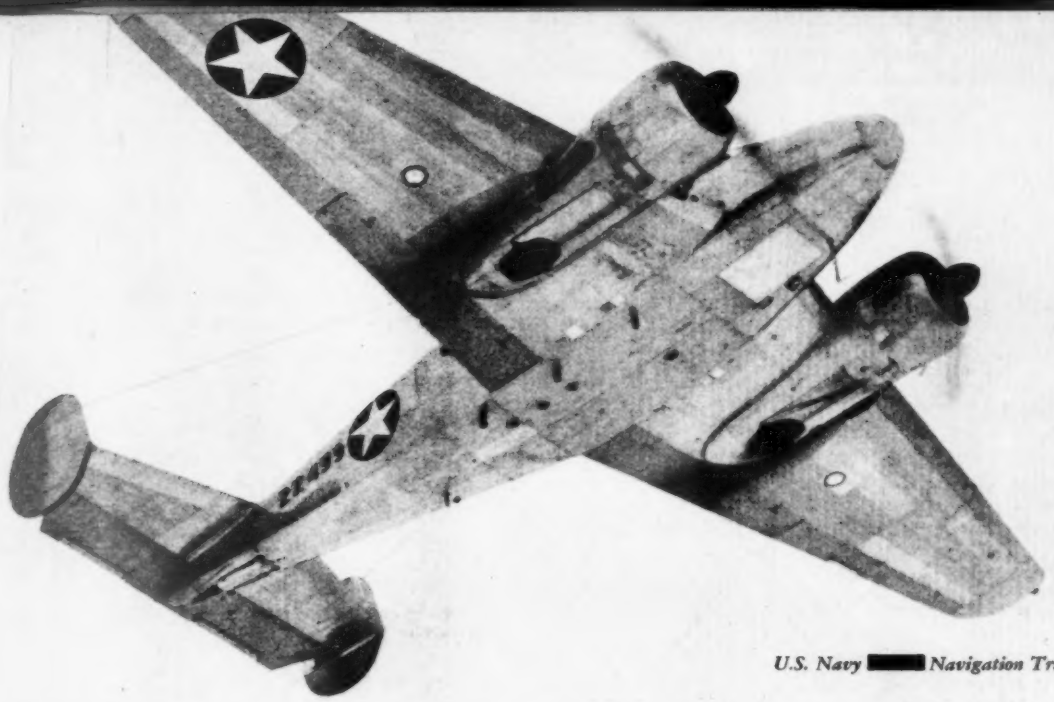
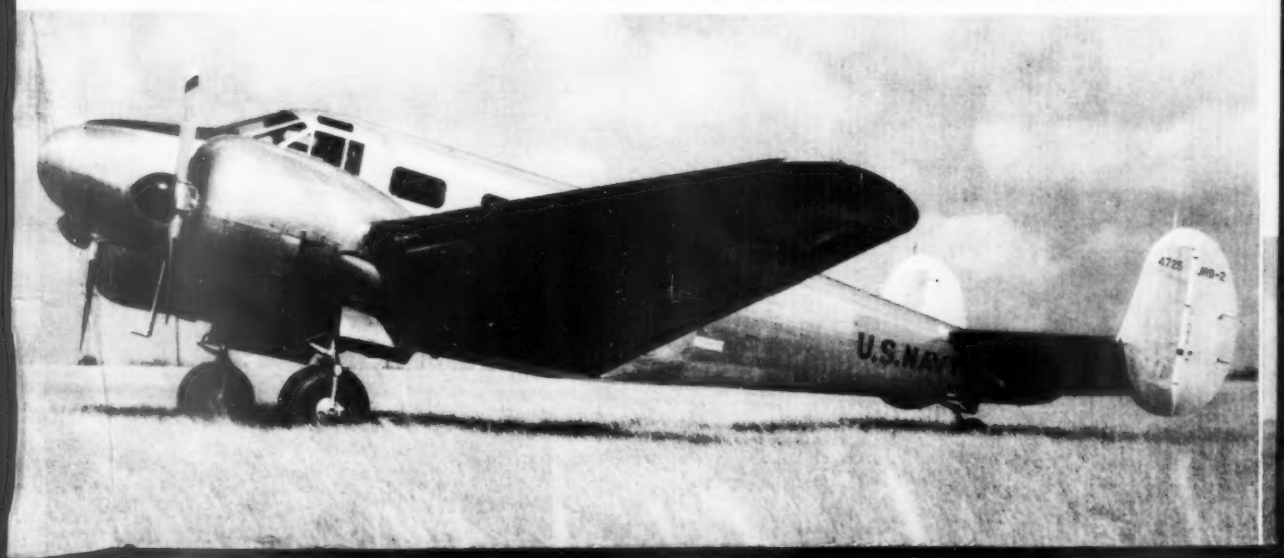


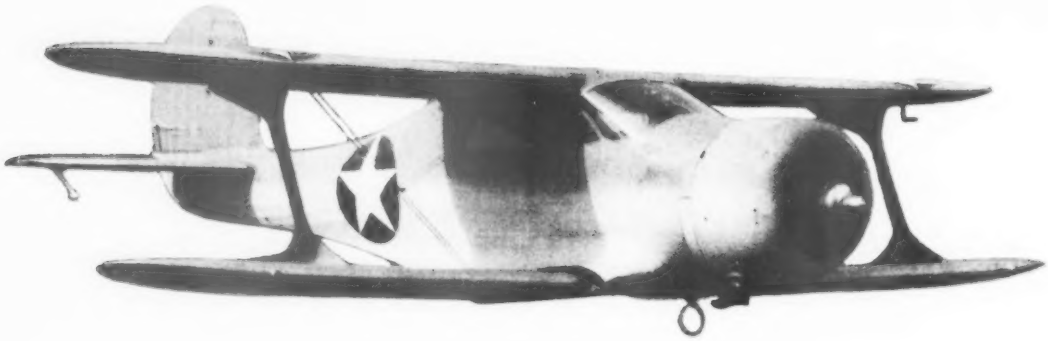
U.S. Navy [redacted] Navigation Trainer (SNB-2)

BEECHCRAFTS IN THE NAVY'S SERVICE

Above—U.S. Navy [redacted] Bombing Trainer (SNB-1)

Below—U.S. Navy [redacted] Personnel Transport (JRB-2)





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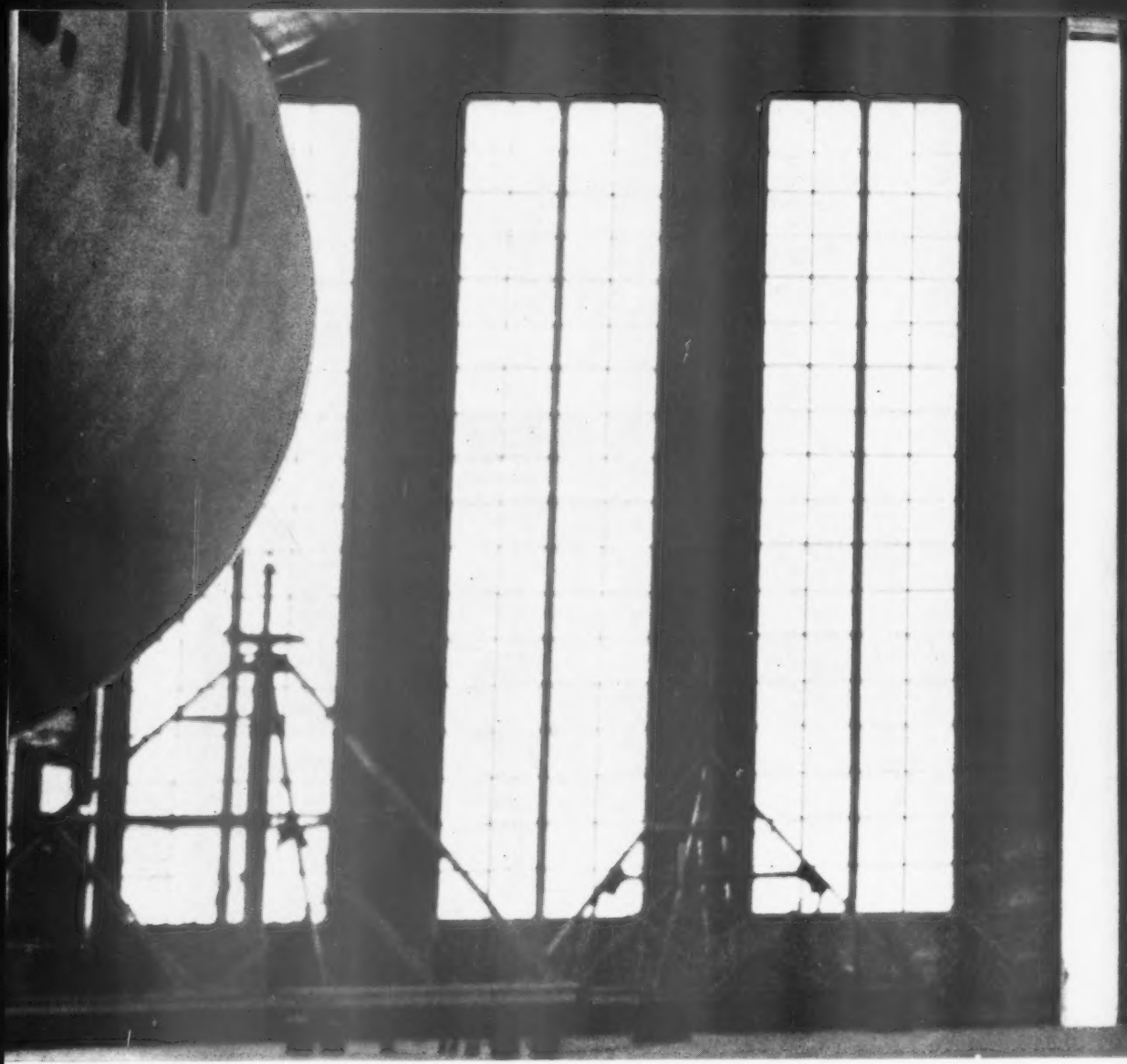

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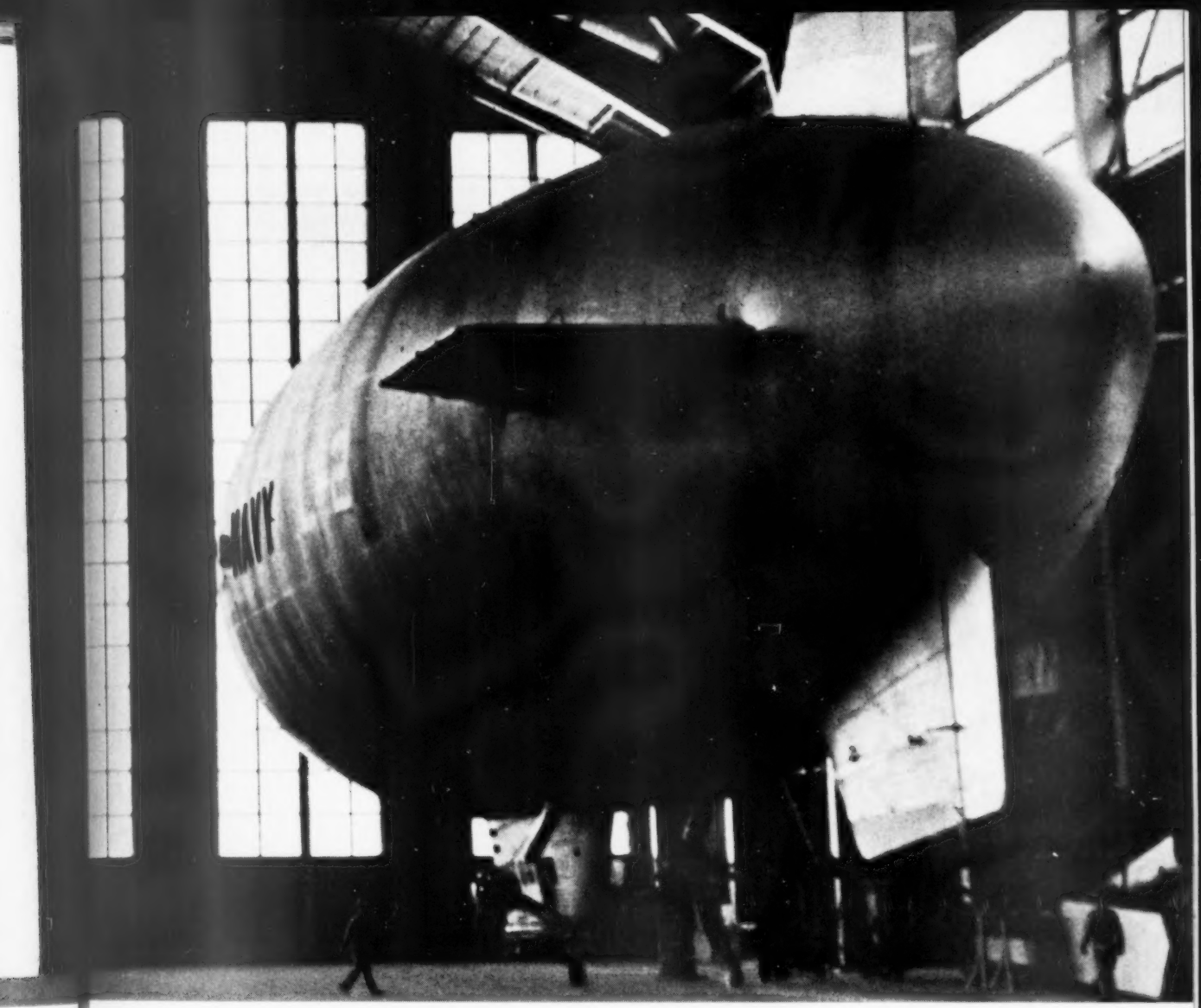

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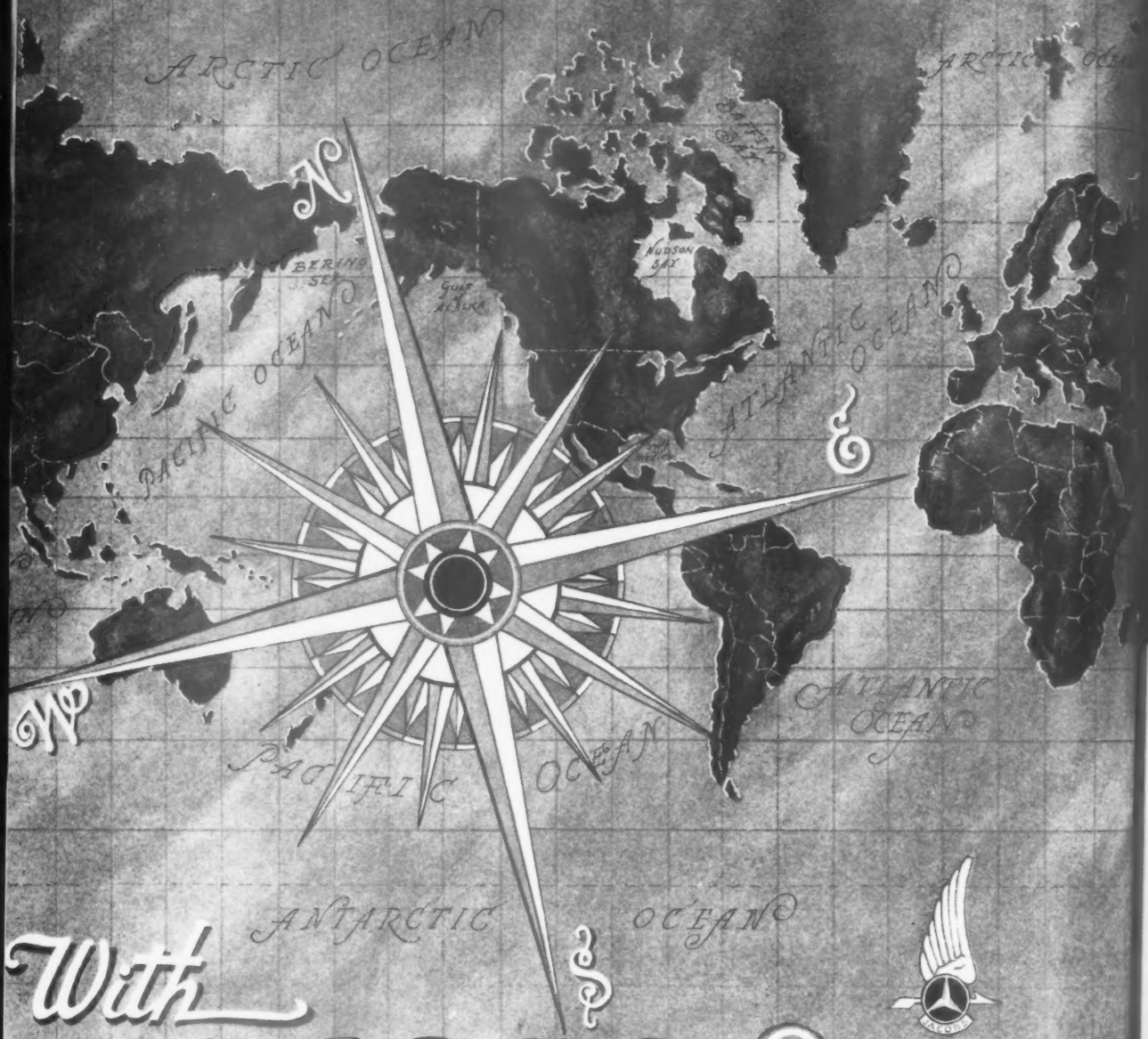

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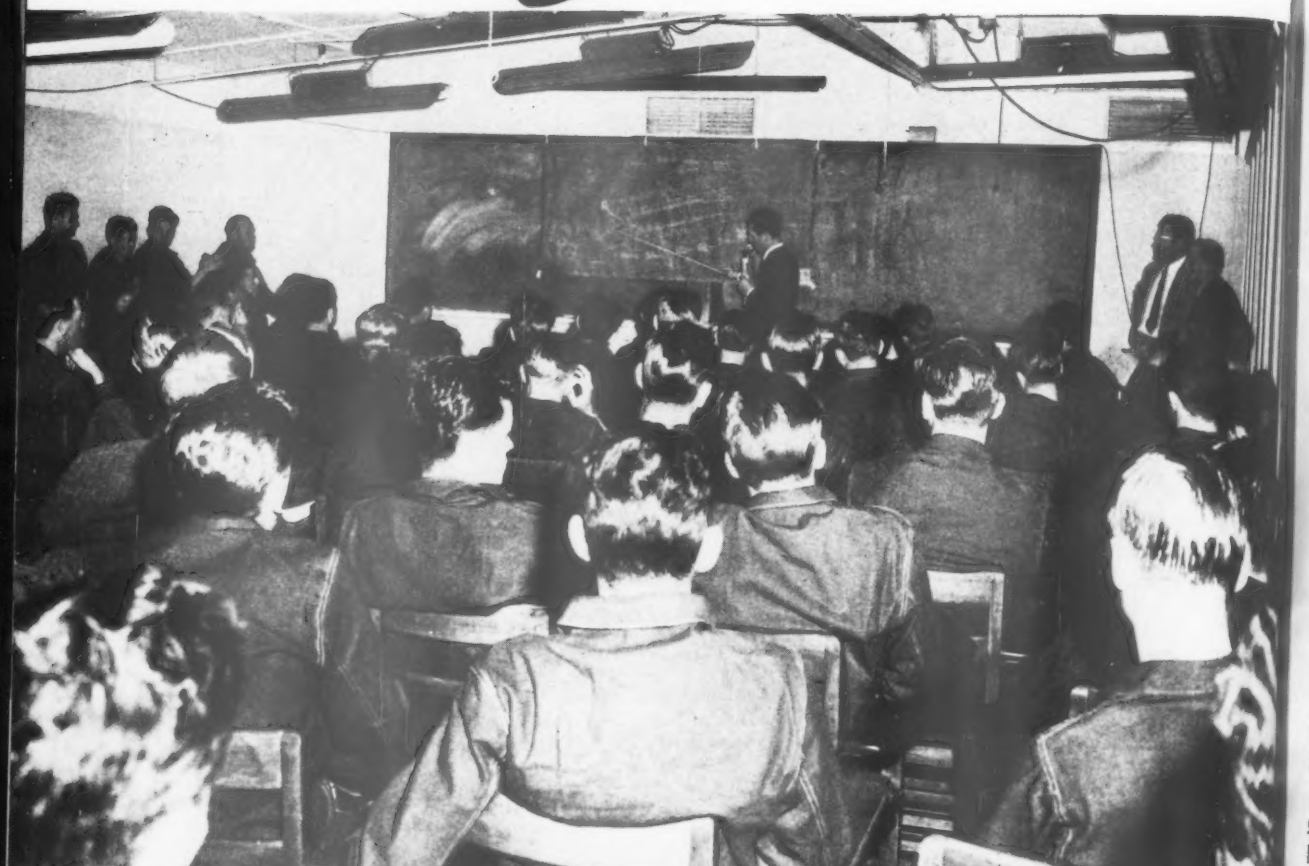

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(*Continued from page* 206)

model. As to armament, the Zeros the Navy has fought in the Pacific mounted two 7.7 m.m. guns and two 20 m.m. cannon—weapons for which our fighters have evinced no preference. The Zero's firing mechanism is gas-operated and not as good as our own. Bullets bearing no percussion marks have been found on the ground, an indication that they merely fell out of the guns. Also, their powder is inferior: the fire of all the Zeros' guns is lacking in sting as compared to our own.

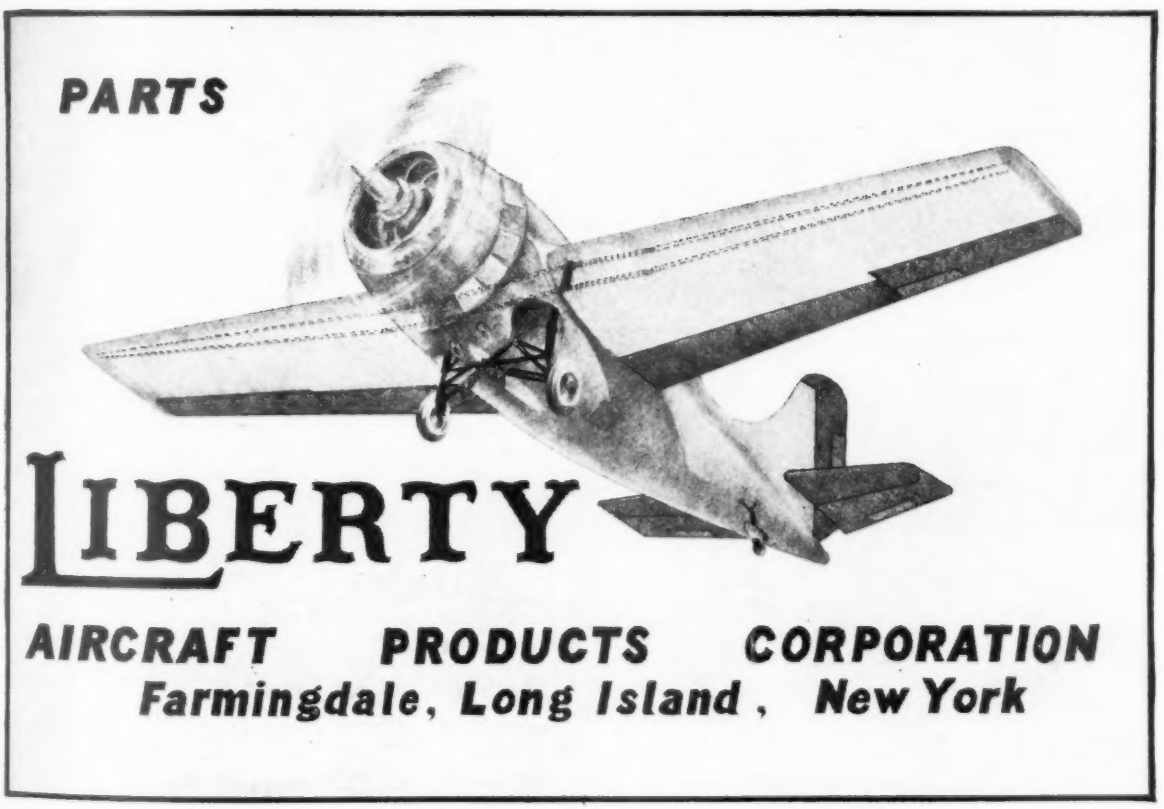
Aside from its several defects, the Zero's maneuverability and climbing power are very superior. American pilots have reported that there have been instances in which they were on the tail of a Zero and starting to fire when the Zero made a sudden, dazzling twist and was unexpectedly returning the fire from a head-on position. At more than 230 m.p.h., however, the Zero's maneuverability is reduced to ineffectualness; the planes cannot make quick turns at this speed. Altogether, the Zeros, while offering no protection to their pilots, are as good as anything we have developed for the single purpose of dogfighting. For shooting down bombers, however, which is the basic purpose of fighter planes, Navy pilots say they prefer the more rugged F4F. But even in the point of fighter combat, the score is decidedly in our favor. Navy pilots have been shooting down Japanese at a ratio of better than four to one. Obviously, then, by the time we have arranged to meet the Jap on equal numerical terms his chances of continuing to function as a fighter menace will be slim.

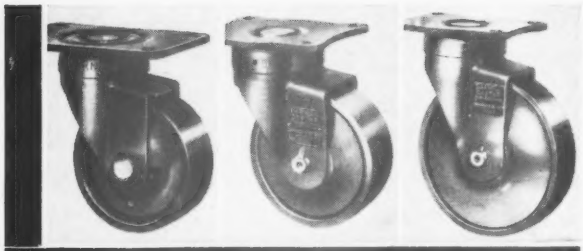
Regarding gunnery training, one of the pilots of the Pacific battles recently said, "A flyer in combat has to be so well trained he can fire his gun mechanically. His plane is simply a flying gun platform. He hasn't time to think. He's got to *know* what he's doing. It doesn't do any good to send us expert flyers who don't know how to shoot. The men and planes will both be wasted. The purpose of fighter pilots is to shoot down enemy planes. If he can't shoot a gun it doesn't make any difference what else he can do."

The Japanese bombers are inferior to our own, and our torpedo and scouting planes are at least as good as those of the enemy. It is an interesting fact that several bombers we have shot down have not been equipped with bomb sights of any kind. As to aircraft carriers, owing to the fact that the Japs, since the last war, consistently lied about the number of carriers they had and were building, they might now conceivably have more carriers than we have, even counting the several they lost in the battles. In spite of the restrictions of the arms limitations agreement, it is likely that the Japanese, in addition, built their carriers larger than those of any other nation. Notwithstanding this seeming advantage, our own carriers are able to get more planes into the air in quicker time—which is, after all, the primary and most important function of a carrier.

A great deal has been written about Japanese suicide attacks. One Jap flyer was supposed to have been found in his wrecked plane with his feet shackled to the rudder controls. Jap dive bombers are popularly pictured as flying their planes directly onto the decks of ships, and ground troops are said to insist on death rather than surrender.. The truth is that the Japs are remarkably well-trained, brave and even fanatical fighters, but the ferocity of their attack is no more suicidal than that of our own soldiers, sailors and marines. Often when a Jap fighter pilot is convinced that the odds are too much for him, even if he's up against only one opponent, his procedure is to turn tail and make for home without delay.

There are exceptions, of course. In any group of fighting men, of whatever nationality, there will always be a few of noticeably excessive courage. The rule with the Japanese is that if they actually do have a preference for suicide, they are generally able to overcome it. The following account by a Navy pilot in the Pacific sheds some light on the subject. Asked if Jap fighters risk collision in a dogfight, the pilot replied, "Well, the only one I ever actually tangled with, we were in a scissors and we gradually worked up to a scissors where I was going uphill and he was going downhill, and he went over me each time until I finally came around and got on him. He wasn't anxious to





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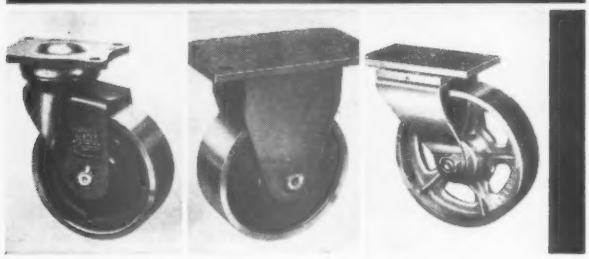


collide at all. He pulled out and over me plenty of times." There have been some instances of dive bombers attempting to crash on the decks of our own or British ships, but in most of these cases the planes had already been badly hit and were on their way down.

This question of suicide among Japanese fighters is rather involved. First of all, the possibility of being taken prisoner isn't recognized by the Japanese military authorities. The Jap soldier is carefully schooled to believe that capture is a disgrace worse than death. When he goes away to battle he is, therefore, at least halfway reconciled to the fact that he may die. "Meet you at Yasukini" is a parting expression often used by the Jap soldier leaving for the front. Yasukini is a much-frequented shrine in Tokyo where the ashes of "fallen heroes" are enshrined.

On one occasion in the Pacific a Navy pilot and a Jap pilot were both downed in a dogfight. The Navy man got aboard his life raft and soon drifted into the vicinity of the Jap, who was in the water. "Do you want to come aboard?" the Navy pilot called out. The other's answer was characteristically Japanese. He came up with a water-soaked revolver and tried to shoot his benefactor. When it missed fire he put the gun to his head and pulled the trigger several times. Unfortunately it never did go off. The Navy man, naturally enough, paddled away. Another time a Navy destroyer drew up alongside a Jap pilot who had been downed and was in the water. The destroyer crew threw over a rope and motioned him to take hold. The Jap, looking unhappy, shook his head. Upon being prompted again he called up in pidgin English (and with apparent regret), "Tojo say no."

With this attitude on surrender, the Jap is hard to catch. He will put up a fight to the last ditch, although it is rare, despite publicity to the contrary, that he deliberately courts death if there is no chance of his being taken.

However—and this is doubtless the basis for most of the talk about suicide attacks—when many Japanese soldiers see that they are about to become prisoners they take immediate steps to kill themselves. But it is always *after* they are captured or when capture seems certain. Pilots who have gone to great lengths to make a successful forced landing have then been known to blow their brains out at the imminence of being taken. "Missing" Japanese soldiers are usually officially reported as killed, and occasionally an urn containing human ashes will be sent to a family as proof of a soldier's death. This seems to make everybody concerned feel better about it.

A Jap pilot recently shot down in China refused to give his name, saying that he was afraid his family would suffer if it became known that he had allowed himself to be captured. Asked what he thought of American pilots, he replied that they appeared to be very courageous and skillful. He added that Jap flyers preferred their Zero fighter to anything the Americans had.

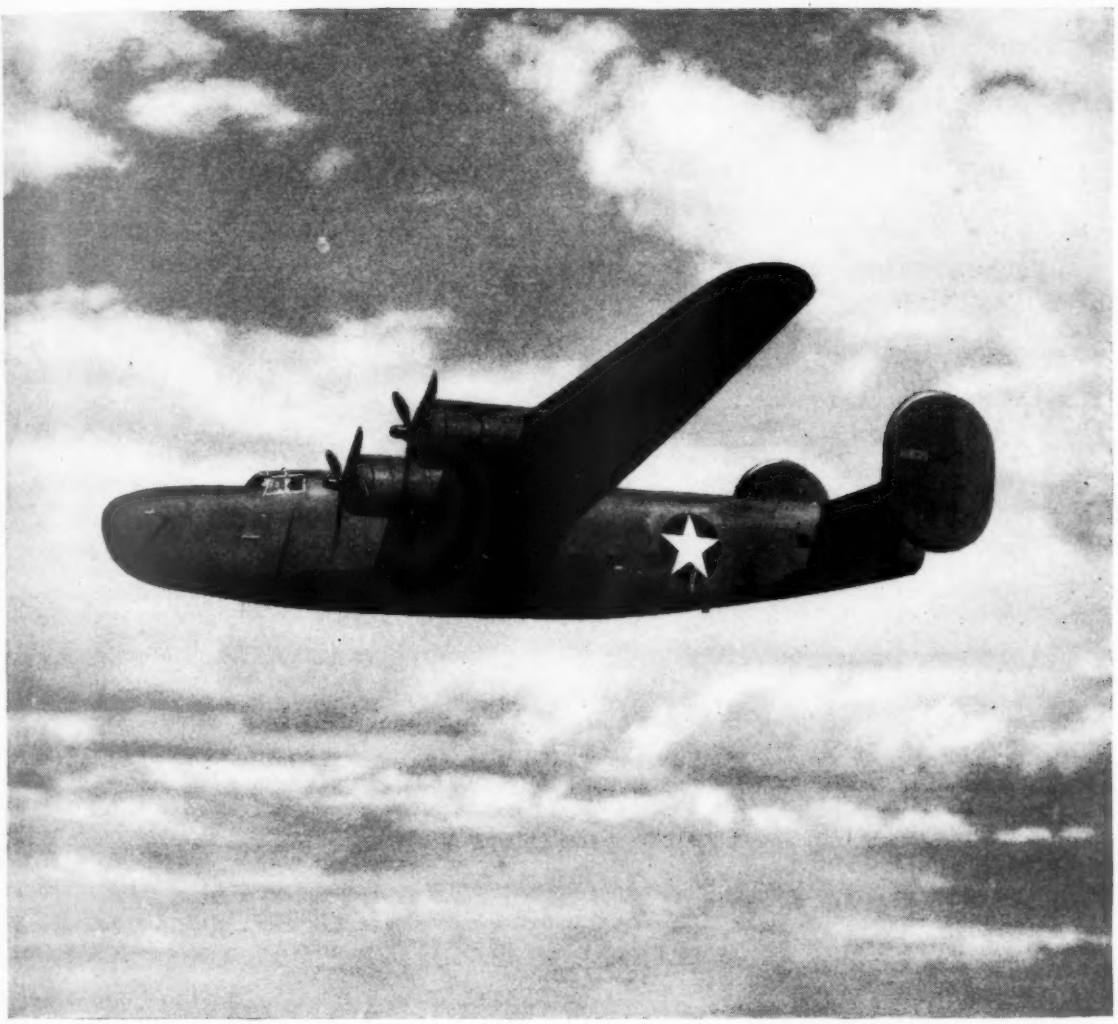
As to dive bombing "suicide" attacks, the dive bombing of some of our Navy flyers has been as suicidal as any done by the Japanese. Lieut. John Powers, who said before the Battle of Midway, "I'm going to get a hit if I have to go in and lay it on the deck," did just exactly that, and died in the performance of his duty. President Roosevelt, it will be recalled, devoted a considerable part of one of his talks to Lieutenant Powers' heroism.

The same young Americans who used to turn the Olympic games into a rout can still beat the best athletes of the world on any field of competition that is chosen for them.

They can do this, of course, only if they have the proper equipment. For years the Japanese denied themselves everything but the necessities of life to build up an enormous storehouse of war machinery. Together with the hard mental and physical conditioning for war they underwent for more than a decade, this gave them the balance of power during the first few months after Pearl Harbor. But even with this enormous advantage they were turned back bluntly as early as Midway. The tide of their driving force was already beginning to ebb. Our Army and Marines, following a path blasted by the Navy, moved out from our defensive positions in the Pacific and headed for the Jap-held islands.

It was the start of an offensive which will progress with mathematical certainty.

END



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LIBERATOR . . . CATALINA . . . CORONADO . . . ALSO C-87's—FREIGHTERS OF THE AIR

'Fighting Three'

(*Continued from page 118*)

approximately 170 miles away. Seventy-six aircraft left the *Lexington*—24 torpedo planes, 36 dive bombers, and 16 fighter planes. Some of these were piloted by Thach's former men, among them Lieut. Noel Gayler, who, as he had in the previous battles, played an important part in the air fighting.

In the early phase of the battle Gayler went out with three other fighters, and came back alone. The three men who failed to come back, it was believed, each got one Jap Zero apiece. Gayler himself got into a veritable nest of enemy planes. As quoted in Stanley Johnston's book, "Queen of the Flat Tops," a first-hand account of the engagement, Gayler described his experience as follows: "This swarm of Zeros kept me in defense maneuvers constantly. There was always one of them making a run at me. Early in the scrap I evaded the attack of one and then jumped on his tail. He immediately resorted to the old Zero trick of zooming for altitude. Remember those babies will climb 4,000 feet a minute. They just love to have you on their tail trying to follow them up. If you do, they climb out of your range, flop over backward at the top of their zoom and you suddenly find them diving back at you when you are almost stalled and easy meat.

"I anticipated the pull-up and gave him a snap burst as he commenced his climb. My bullets hit him and he began to burn.

"I ducked into a cloud at once to evade the swarm again. They kept me in there for a couple of minutes. I'd duck out one side and they'd be there waiting. I'd climb to the top and find them up there. I'd go to the bottom and run into some more. That cloud was home to me. Finally I came out one side, saw a Jappie below me. The Jap saw me and made that instinctive pull-up right in front of my guns. I gave it to him and he, too, burned."

On the way back to the *Lexington*, Gayler, as a kind of afterthought, knocked down two more Zeros. This brought his total to eight clean kills.

It is, of course, unfair to single out one pilot or one gunner or one sailor or any individual for particular attention in the battles. It is not too much to say that all of them, by doing their respective jobs, qualified as heroes, but the records on some men are more explicit than on others, and it is upon those men that the historian probably will concentrate. Lieutenant Gayler, to be sure, was outstanding on several occasions. However, the attitude of the air groups as a whole perhaps can be summed up by the following anecdote involving a young ensign who was a dive bomber pilot in the Coral Sea battle.

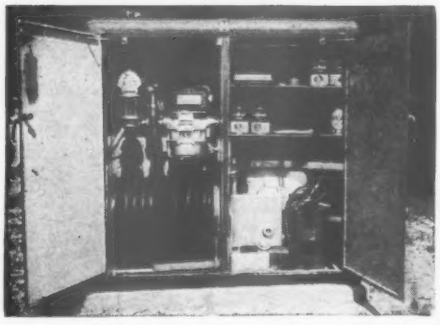
At the conclusion of the first day's fighting, during which all the flyers, by prearrangement, had been directing their fire almost exclusively at the carriers, a gunnery officer, one of the last to leave the scene, was astonished to see a Jap heavy cruiser turn over and sink. When he returned to his ship he started an immediate investigation to see who had got the cruiser. No one seemed to know what he was talking about. A search of the pilots' reports failed to disclose any mention of an attack on a cruiser. All of the air control officers became interested in the case, and they started making personal inquiries everywhere.

Finally an ensign went up to his squadron commander and said, "I'm terribly sorry, sir. I'm the one who did it. I started to bomb the carrier but could see she was sinking. While I was flying around wondering which ship to give my bomb to, this cruiser started to shoot at me. So I said, 'All right, then, I'll give it to you.' So I did. It was only a cruiser, and I didn't think that worth while reporting."

The total score of the Battle of Coral Sea, which Thach's alumni helped carve into an important victory, was: One enemy aircraft carrier sunk with perhaps 80 planes, another enemy carrier, also carrying 80 planes, heavily damaged, and a third damaged; one enemy light cruiser sunk, 91 airplanes of various kinds shot down in air combat, and additional planes knocked down by antiaircraft fire. Our own losses were an aircraft carrier sunk, (92 percent of her personnel and 18 of her planes being saved) and another carrier damaged. We lost 27 airplanes of different classes.

Meanwhile, Lieutenant Commander

A COMPLETE LINE FOR DEFENSE



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Thach, back at Honolulu, was busy with his new pilots for Fighting Three. "I took the first group they sent me for training," he has since written "and we flew hot and heavy all day long and let the paper work go to hell." When the carriers returned from the South Pacific shortly before the momentous Battle of Midway, Thach had about half a squadron of pilots. They had never operated from a carrier, but they had learned gunnery—a fetish with their commander—and something about fighter tactics in the past six weeks. Thach and the pilots went aboard the *Yorktown* and went to sea. They saw action much sooner than they expected. A battle was brewing which was to play a most decisive part in shaping the future warfare in the Pacific. The Japanese had gathered together a tremendous fleet of two prongs, one of which feinted toward the Aleutians. The other, comprising a striking force, a support force, and an occupation force—altogether about 80 ships — arrogantly proceeded toward Midway Island. Their purpose unmistakably was to occupy Midway, a project which they doubtless regarded as largely a matter of accurate navigation, and then to take the rest of the Hawaiian chain. After that, not only Alaska, Australia and the Panama Canal but also our own West Coast would be in danger of attack. However, as a poet once pointed out, the very best laid plans have a habit of ganging aft agley.

On June 3, Navy patrol planes were making their usual flights in the clear, blue mid-Pacific early morning. The first announcement of the presence of the enemy came a little after nine a. m., when a patrol flying boat reported, "Two Japanese cargo vessels sighted bearing 270° distance 470 miles. Fired upon by antiaircraft." This was followed by a report from another plane that the main body of the Japanese fleet had been sighted at a distance of 700 miles. At 11 o'clock on the morning of June 4, acting on rather meager information as to the exact location, composition and disposition of the enemy fleet, Lieutenant Commander Thach and five other pilots of Fighting Three took off as a protective escort for a squadron of torpedo planes and dive bombers. Shortly after noon there were visible in the sea streaks of white which proved to be the wakes of three enemy carriers and a number of heavy cruisers and destroyers.

As the torpedo planes and fighter were about to close in, antiaircraft fire began and 20 Zero fighters came swooping down out of the clouds above them. A few seconds later several more Zeros came in from the side. "There were so many fighters above us," Thach said later, "that they had to wait their turn to come in and attack." Despite odds of six or seven to one, Thach and his pilots chased the Zeros off, shooting down several of them while losing one plane of their own. The torpedo and dive bombers scored extremely damaging hits on all three carriers, putting them out of action.

Thach's fighters returned to the *Yorktown*. A few minutes later a large force of enemy planes was seen coming in fast. Ten of the *Yorktown's* fighters were in a position to intercept. Only four of the Jap's dive bombers got through, but they got three hits on the *Yorktown*. While an enemy torpedo attack was developing, the *Yorktown* launched eight additional fighters. In order to get a shot at the torpedo planes, the fighters had to be launched off the bow, in the face of their own antiaircraft fire. Then they shot down eight of the torpedo planes, and lost four of their own number. In the early part of the war, fighters occasionally were shot at by their own AA gunners. During Midway a member of Fighting Three was actually in the landing circle about to land aboard when a young machine gunner with an itchy trigger finger opened up on him. When the pilot had landed he walked back and said, "Young man, if you persist in shooting at me every time I come aboard I'll report you to the gunnery officer."

In the entire Midway action Lieutenant Commander Thach and Fighting Three lost six planes to enemy action. One of these landed aboard but was so riddled by bullets it had to be pushed into the sea. The damage caused to the Jap fleet by the *Yorktown's* air group, however, was substantial. It consisted of one aircraft carrier sunk or badly damaged, seven fighters shot down, 13 bombers shot down, eight torpedo planes shot down, seven fighters damaged, seven bombers damaged and two torpedo planes damaged. The *Yorktown* sank as a result of enemy bomb and torpedo hits, so Fighting Three finished the battle on the carrier *Enterprise*, again having made an impressive score in an engagement on which the enemy had gambled heavily and lost.

Most of Fighting Three is now "somewere in the Pacific," its exact whereabouts a military secret. Its current skipper is Lieutenant Commander O'Hare, who knocked down the five Japs all in one busy afternoon. Lieutenant Gayler is in this country on temporary duty testing new planes. Lieutenant Commander Thach is back from the wars and training more pilots. Soon, possibly, all of the squadron will be together again. If this reunion does take place it will undoubtedly result in some more very thin times for the Japanese. END

Drill Holsters

HOLSTERS are back in use again "way out West" where men are making bombers now instead of riding the range and those holsters are for electric drills, rather than six-guns, at the Vega Aircraft Corporation's Burbank, Calif., plants. Made of sheet steel, with a bracket at the back and a notch for the trigger at the front, the rounded pocket permits the drill to rest on its frame with its chuck and bit protruding through the open half of the lower end, and hangs at the edge of the bench, rather than cluttering up the working space.

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Convoy

(*Continued from page 137*)

marine commander's statement that the disaster occurred to the U-boat because one of his men *who had not had enough experience had made a mistake.* The announcer made a subsequent explanation and apology in the broadcast which said: "Yes, of course, he made a mistake. Yes, of course, he lacked experience. But although they make a mistake from time to time, they love adventure and they are gallant fighters . . ."

It is surprising to see the Germans admitting that any member of their crew is inexperienced and what is not so surprising is the fact that the true story of the rescue was suppressed! As a matter of fact the rubber boat was dropped to the crew struggling in the water immediately after the attack, whereupon the submarine commander and the next most senior officer clambered into the boat from whence they witnessed the death struggles of the rest of the crew during the succeeding 50 hours, before being picked up by a seaplane which landed alongside. If there ever was an example of gallantry and heroism in reverse it was this case of "Gangway for an officer, we can't all be saved!" This seems to afford the horrible example, according to our standards, of everything an officer should not be.

The last war showed that ships in convoy had little fear of U-boats. Gallons of ink and acres of paper have been used since World War II began explaining what marvelous technical advances the Germans have made in the construction and operation of their submarines. This is mostly smoke—but, of course, there must be some fire. As a matter of fact, most of the improvement made to the submarine has been in the nature of refinements, such as higher speed, tougher hide, the ability to dive quicker, better periscopes and so on. The real "improvement" that the Germans have made is to have several times as many submarines as they had in the last war! Another improvement has been the evolution and adoption of the highly publicized wolf-pack tactics. This is an obvious procedure and simply the logical use to make of additional numbers of available U-boats. Particularly is this true when notice is taken of the comparatively smaller number of surface vessels able to keep the sea as escorts for transatlantic convoys. Had the United States started more extensive building of escort vessels, similar to corvettes and destroyers, before our actual entry into the war, the U-boat would doubtless now be well under control. However, there is no use crying over spilled milk and it may be that the tremendous usefulness of aircraft in combating submarines would not have been discovered and developed quite so soon had there been ample numbers of escorts. As it is, joint action of aircraft and surface vessels is now considered to be the real answer to the submarine. Although the submarine has a high surface speed compared to the usual merchantmen, it is an easy prey to the airplane. And the submarine commander furthermore knows that once he is sighted by an airplane, even though he should be fortunate enough to escape, depth bombs will surely be showered down on him in a matter of seconds. Also, the airplane will call up fast destroyers which can track him down with their listening equipment and "hunt and haunt him to destruction"—for days, if necessary.

The Germans are playing a poor game when they try to use wolf-pack tactics in the presence of air support, for the overjoyed pilots, bored with the tedium of hunting for single submarines, then find themselves presented with a multiplicity of targets, all concentrated in one little area for their benefit. The realization that this is true must have come with a terrific shock to a recent wolf-pack after their period of easy hunting along our Atlantic Coast.

In the case of the particular convoy in question, six U-boats had apparently selected a victim and were forming up out of visual range of the convoy when one of them was sighted by a PBY operating from one of our northern bases. There were two other planes of the same squadron in the vicinity and in the short period of about an hour the three planes got in six attacks on the submarines. Destroyers joined in the fun and the wolf-pack quickly became a very badly frightened "sheep pack" instead.

The submarine campaign has moved in cycles, the hard-pressed German submarine high command constantly seeking a favorable opportunity for using its weapons of stealth. Before our entry into the war the German submarine campaign had achieved some success but our neutrality must have been a severe thorn in Admiral Doenitz's side, for the transatlantic convoy system was growing stronger and stronger and the Germans were losing more and more submarines with a decreasing ratio of success. Undoubtedly, he therefore, was searching for a favorable opportunity to strike elsewhere and it must have been amusing to witness his fury when the Germans were caught flatfooted by the treacherous Japanese attack upon Pearl Harbor. That the Germans *were* caught flatfooted is obvious since it took Admiral Doenitz a month and a half to organize the campaign and get U-boats over here to concentrate upon the easy victims which our coastal traffic afforded. The hunting was good for the U-boats and for a time much damage was done before our counter measures became effective.

Bad weather and fog make the task of the submarines easier and, therefore, the need for air support more pressing. Furthermore, there is nearly always some bad weather some place in the North Atlantic.

To date a major part of aerial escort of convoy has been done by flying boats because of their great endurance, the

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heavy bomb loads they can carry and the fact that they could be moved quickly into places where there is sufficient sheltered water for an operating area with only the necessity for having a tender to accompany them. They could—and did—move into a number of places in a hurry and start work at once. Now that time has permitted building air-fields in certain areas which are not subject to destruction by enemy bombers, the use of fast landplanes to augment the seaplanes may be expected in the future.

Another employment of aircraft for the protection of convoys has been the use of fighter planes to protect the surface ships from enemy dive bombers and torpedo planes when the convoys get within range of the bases at which those types are kept. This phase of air support of convoys probably will increase, too, as more converted carriers become available.

Probably every student of history is familiar with the fact that the breakdown of morale in the German submarine fleet, and the mutiny which ensued, precipitated the German crackup at the end of the last war. Many responsible and well-informed officers now believe that history may well repeat itself and that this war, so far as the Germans are concerned, is apt to end the same way. That the airplane is contributing materially to the potential demoralization of U-boat crews is clearly demonstrated by the remarkable readiness of the German submarine commanders to submerge, leaving parts of their crews on deck, in their frantic haste to escape from aircraft attack.

Their desire to get away from our planes is, of course, understandable but this cannot improve the morale of their crews nor the spirit of comradeship aboard U-boats. It certainly is no boost to the morale of the hapless individual, sometimes wounded by the bombs or machine gun fire of the attacking aircraft, who is left behind.

Not every U-boat is seen and attacked, and not every one attacked is sunk. Nevertheless, enough reports similar to the one quoted below are received in increasing numbers to be reassuring. This report stated, in effect:

"After conclusion of the attack, the U-boat was seen to have stopped. As the plane circled, the U-boat slowly turned over on its side and sank stern first, leaving a large patch of oil disturbed by gushes of air at intervals in the middle."

Obviously, not every flight can end so successfully, but those received make pleasant reading and provide certain assurance that Admiral Doenitz will have an unhappy time for a week or two trying to figure out what happened to yet another of his undersea rodents.

So the U-boats are not having things all their own way and the battle still goes on. It is far from won yet, although the way to do it seems clear. What is needed is a still larger number of planes, crews and ships; crews who are experienced in navigation, foul-weather flying and, particularly, flying in close co-operation with surface escort units. There cannot be too many planes or escort vessels and enough is known about the problem now to state that the U-boat menace can be licked once the men, planes and ships become available.

END

The Carrier

(*Continued from page* 80)

Lexington, causing serious fires to break out in many parts of the ship. It was a first thought that the explosion was the result of a "sleeper" bomb. Investigation revealed, however, that the probable cause was the ignition of gasoline vapors which resulted from leaks in ruptured gasoline lines in closed compartments below decks."

"The crew fought heroically for more than five hours to save the ship and were at great disadvantage because the explosion had damaged much of the fire-fighting equipment. Destroyers were sent alongside to assist with their pumps, fire hose and chemical fire-fighting equipment. The wounded were transferred from the burning carrier to the destroyers alongside. Finally, with all machinery disabled, the ship stopped and flames enveloping her nearly her entire length, it became apparent that any further attempt to save her was futile and the captain ordered the crew to "Abandon Ship." Men slipped down lines from the carrier's decks to boats from other ships while some crawled aboard life rafts and rubber boats."

"Ninety-two percent of the ship's company were rescued and have reached port safely. The only casualties were the result of the battle or the explosion and the resulting fire. . . ."

(Author's Note: Later checks showed over 95 percent of the *Lexington's* complement were saved.)

The foregoing account should help disprove the contentions that the carrier can't take it. Carrier duty has been and undoubtedly will continue to be in increasing measure one of the most popular duties with the men of the fleet. Perhaps this would be more understandable to the layman if I described briefly one of these mobile airports and explained something of the life aboard.

To begin with, the carrier is a big ship, ranging, say, from 500 to 900 feet long, and displacing, in the case of the larger ones, 30,000-odd tons. Also, some critics to the contrary notwithstanding, she is a fast ship, with a maximum speed in some cases as high as 34 knots. Instead of the topside turrets and big guns of the battleship, she has a long overhead flight deck from which she looses her broadsides—from 50 to 75 hard-hitting fighters, bombers and torpedo planes. And, whereas a battleship's guns have to be replaced at considerable trouble and expense after a few hundreds rounds of firing, the carrier's batteries can be replaced at an hour's notice. The range and power of these batteries increase from year to year, while the range of a battleship's guns tends to remain constant during the life of the ship.

Down below, the carrier has an enormous hangar deck which is used as a place for storing and repairing the planes. In her magazines she carries, instead of shells, great stores of bombs, torpedoes and ammunition. Besides this, she must carry not only enough oil for her own propulsion, but enough high octane gas to fuel her air group. A great many uninformed persons somehow have got the notion that the carrier, except for her planes, is practically unarmed. Nothing could be further from the truth. She is studded from stem to stern with five-inch and multiple pompom antiaircraft guns, although her fighter planes do serve as her chief defense. The range of the carrier's offensive power is an improvement on anything along these lines developed in sea warfare to date. Through her planes she can blast an enemy with murderous accuracy several hundred miles away. The firing range of ship-borne Naval guns obviously falls a bit short of this.

Perhaps a good explanation for the carrier's popularity with sailors and officers has been its exciting daily routine during peacetime. I hardly need point out that carrier personnel have had no cause to complain of inactivity since December 7, 1941, but even in normal times there is always excitement on these floating airdromes. The life aboard is a succession of drills, a constant striving to increase efficiency. Dive bombing, homing drills, gunnery practice and all the other adjuncts of effective Naval action are repeated over and over until the men perform their various functions with an instinctive correctness. In the matter of dive bombing, for instance, the pilots make trial dives many times a day, climbing to 18,000 feet and coming screeching down to pull out, just after the bombs have left their planes. Landing the planes aboard is always one of the most interesting phases of the routine on a carrier.

Sometimes as many as 75 high speed aircraft will be wheeling around, getting into the "landing groove." They land at very short intervals—an operation which obviously calls for extreme precision. In a normal landing the carrier is steaming ahead into the wind. If the sea is rough and visibility is poor, setting a fast airplane down on a small platform presents difficulties. Excellence in this operation, as in all the carrier activity, is achieved by ceaseless practice.

Now, in wartime, all this daily routine of the carrier is changed. The clockwork program of reveille, drills, inspections, meals and recreations have given way to the extreme urgency of battle preparedness. The decks are stripped for action, routine and regular watches have gone overboard, everything is designed for one purpose—to keep the planes in tip-top repair and ready to go at a moment's

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notice. The men who work on these repairs sleep when they can, eat when they feel like it (with the galleys always open to them) and sometimes rest the clock around when their job is finished. No luxury prevails, for living quarters have been sacrificed to give space for more essential needs. Comfort has been thrown overboard until the seas are cleared of the barbarous forces that are menacing our freedom.

This latter can be done, I wish to say again at the risk of being repetitious, by building enough aircraft carriers to take the fight to the enemy. This we are doing. Most of the actions we have fought to date have been defensive. Fighting of this sort can stave off defeat, but it does not win a war. Except in the matter of numbers, our carriers are more than a match for those of the enemy. It became evident shortly after the war started that the Japs had consistently misled the world about the numbers of carriers they had built and also about their size. It is possible that some of the Japanese carriers are larger than either the *Lexington* or the *Saratoga*. This misrepresentation of their fleet extended as well to other types. A good look at the photographs of the battered ship *Mogami*, which the Japs classed as a heavy cruiser, reveals that it was in fact a battle cruiser. However, on the important basis of getting the most planes into the air in the shortest time, our carriers are the best in the world. Also, their antiaircraft fire is more accurate than that of the Japs, although it cannot be, I regret to say, completely effective protection against a determined combined attack of dive bombers and torpedo planes.

As to the discussion concerning land-based and carrier-based planes, I would like to point out that, although both types naturally have certain points of superiority, ideally they should supplement each other, with the land-based planes hammering the enemy within their range and the carriers taking the fight beyond that range. Shore-based aircraft may be presumed to have certain advantages over those used on carriers; among other things, they are unhampered by short take-off runs and have higher landing speed. They are, however, limited in their field of action to the area within their range and by the facilities which can be made available to them by their base—in many cases a small island far from the sources of supply. Aircraft carriers, on the other hand, are highly mobile bases which can be concentrated suddenly in any area desired and carry all the facilities with them. The present-day task force usually consists of carriers, cruisers, and destroyers, with carriers as the capital ships. Destroyers are needed as protection against submarines, and the heavy guns of the cruisers are needed to guard against surprise attacks by other surface vessels at night or when visibility is so bad planes cannot get into the air. The chief defensive power of this kind of task force, however, springs from its great offensive power, in accordance with an antique but well-proven adage: "The best defense is a strong offense."

All in all, at this stage of aviation and Naval development we *must* recognize that there has been a tremendous revolution in sea warfare. That is the great lesson we should have learned from the war so far. The answer is simple and may be stated briefly: Whichever nation has the best carrier force is going to control the seas. The sooner we become alive to this realization and act accordingly, the sooner we can begin to win this war. In fact, it is the *only* way we will win the war in the Pacific.

END

Slippery Runways

THE Civil Aeronautics Board has issued a warning to pilots to be particularly careful when landing on runways following or during a rainstorm. The CAB points out that during the past year a number of accidents have occurred in which experienced pilots landing familiar equipment on familiar airports found it impossible to stop the landing roll within the airport boundaries. In each case the mishap would occur during or immediately following rain. Pilots reported that brakes had no effect.

The CAB urges that when it is necessary to land under such circumstances, the pilot should be prepared to go around again if for any reason the landing is not as short as he can safely make it, adding "a second try is not nearly as embarrassing as a crack-up."

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Medicine

(*Continued from page* 162)

frequently disabling phenomenon can be delayed, or prevented by a process called denitrogenation. This consists simply of breathing pure oxygen prior to ascent, to replace the inert gas nitrogen, so that there is far less of the latter to be liberated as pressure is reduced more and more, with increasing altitude.

Another problem baffling both to the engineer and the aviation medicos is that of extremely low temperatures (temperature drops about two degrees for every 1,000 feet of climb, until a constant low of between 55° and 65° Fahrenheit is reached at about 40,000 feet). Scientifically made clothing has been designed to help.

High speeds plus maneuverability can impose destructive forces on wings and fuselage, many times the force of gravity. Turns at high speed and pull outs from diving attitudes can impose these same forces upon flyers, causing greying out, blacking out of vision, or even loss of consciousness, depending upon stresses applied.

These have been partly alleviated as the result of careful studies in giant human centrifuges or rotators which can impose forces even higher than those which aircraft can withstand. Much has been learned as to means of compensating for these forces.

Numerous research studies have been carried out by flight surgeons in connection with these and many other stresses experienced by our flying fighting men. The results of this study offer definite tactical advantages, so they cannot be discussed in this article for reasons of military security. But the work continues at an accelerating pace.

When it was suggested that a suitable title for this article would be "Flight Surgeons on the Fighting Fronts," it seemed first of all that the work of the laboratory and of the training bases must be included as a part of the picture; and that the fighting front must extend from the laboratory to the Solomons.

Over there, our flying medical officers are alert to all the new problems associated with modern aerial warfare. They know and report immediately when Bill Smith is beginning to show the preliminary signs of having passed his peak of combat efficiency. At this point the judicious recommendation of a short period of leave and recreation may serve to save a valuable fighting man for future work.

The flight surgeon performs these duties *in addition* to his other and routine duties as a medical officer serving with combat groups. He flies with the patrol wing to which he is attached, or with his carrier groups, he lives in intimate contact with them and knows them only as men get to know one another who have lived together in close quarters, trained together and have finally committed themselves to the high endeavor and the supreme risks of their country's defense.

He follows them into established beach heads in amphibious warfare and is proud of the fact that he can render to them the highest type of medical and surgical assistance. In the face of ruthless, uncivilized or savage enemy forces he bears arms—under all other conditions of warfare his job is essentially humanitarian, and he carries no defensive weapons. On aircraft carriers, tenders or with his squadron, he knows that he is subject to the same risks as those with whom he serves, and that the Geneva Conventions offer him no protection. He is inordinately proud of the service to which he has devoted his career and of the uniform which he wears.

Some of our flying medical officers are fully qualified as Naval aviators and for "actual control of Naval aircraft." All of them fly, the better to know and to understand the problems of flight and the men who fly.

Typical of the flight surgeon who flies is the following history of one of our Allies' outstanding officers:

He had full pilot rating and was qualified for control of bomber and fighter aircraft. Duties: Regularly assigned duties—staff medical officer to a fighter command. This involved almost uninterrupted flying to fighter stations, both night and day. The primary purpose of such flights was to establish and maintain intimate personal contact with all

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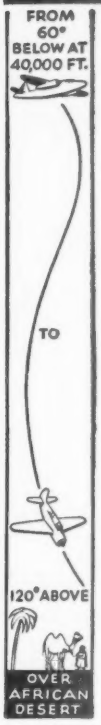

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medical officers in the field and to insure that their indoctrination and instruction in aviation medicine was continuously accomplished.

Since the medical officer in question was a fully trained fighter pilot, it was considered part of his duties to fly on operational missions. In performing these, he actually gained considerable combat experience and first-hand knowledge of the problems facing personnel in combat operations and of the strains to which they were subjected. The missions referred to included night and day interceptions and intruder or strafing attacks. During one of these missions, his squadron was attacked by enemy aircraft and his aircraft suffered a number of hits which caused engine failure. His aircraft failed to return to base and he was reported missing as a result of enemy action.

Another report indicating the type of mission which the flight surgeon may be called upon to perform is the following:

News was received that a plane or number of planes were down in foreign territory in a desolate area. Medical gear was assembled and, at 5:30 a.m., a flying boat took off carrying the medical officer to the scene of the reported crash. At approximately 7 a.m., a number of planes were sighted on the beach, and the pilot brought his aircraft down about two miles from the shore.

Medical gear was stowed in the rubber life raft and the pilot and medical officer rowed ashore through heavy seas. Upon reaching the beach they found one pilot dead, one with a compound fracture of the arm, and the remaining pilots and crew members suffering from contusions and lacerations. The injured men were immediately given first aid and their injuries dressed. It was necessary to cleanse the compound fracture with boiled sea water and green soap, and after application of dressings a splint fashioned from parts of a wrecked aircraft was used.

An attempt was made to move the injured man and the body of the dead aviator by carrying them through one-quarter mile of mud and water in the rubber boat, so that the flying boat could be reached. This had to be abandoned due to the heavy surf and tide. Additional food and water were secured from the flying boat and all hands made as comfortable as possible for the night.

On Wednesday morning, a rescue boat appeared off the shore and the injured man was placed in the rubber boat and pulled or carried through a mile of mud and surf to the boat. It took approximately two hours to perform this task. The patient was immediately made comfortable and more intensive treatment was instituted.

During the evening it was noted that the arm was swelling and had a slight stench. The commanding officer of the ship indicated that it would take about 20 hours to reach the nearest port.

In the meanwhile, a small plane had been able to make a landing on the beach; so rather than risk the long delay in getting the patient back for adequate treatment, he was lashed in a Stokes stretcher and again taken ashore on a sea raft. He was immediately evacuated by the plane, and the remaining men of the aircraft crews taken out to the rescue boat. The body of the dead pilot was buried at sea.

This is indicative of only a few of the difficulties which medical officers attached to aviation may encounter in the performance of their duties.

Another incident in lighter vein was reported only a few days ago from Guadalcanal in the Solomons:

During a strafing attack by Japanese aircraft, a Maj. Dan C. Gaede of the Army Air Force dove headlong into a foxhole and landed squarely upon a Navy officer who had just preceded him. During a cessation of the attack, he introduced himself, saying, "I am Maj. Dan Gaede of the Air Forces." The Navy flyer replied, "And I am Dave Gaede of the Navy Medical Corps." Closer check revealed that they were cousins. They had never met before.

END

New Gas Tank

AN auxiliary airplane gasoline tank, which can be dropped in flight by pulling a trigger, is the latest contribution to the war effort by the Vidal Research Corporation of Camden, N. J. Made entirely of wood and plastics, the tank is of the conventional teardrop shape, carefully streamlined to eliminate wind drag and to give better climbing ability.

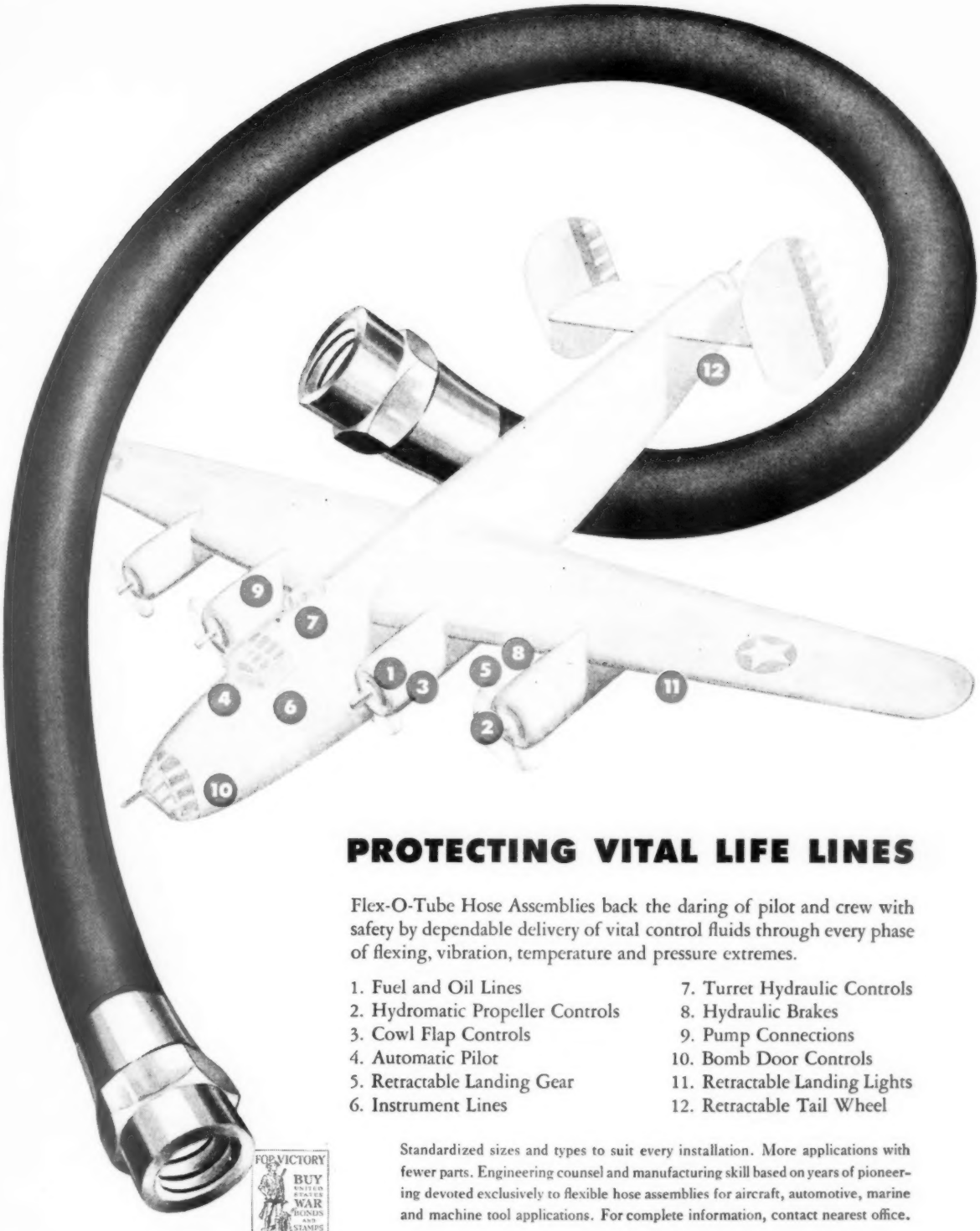
The idea of making gasoline tanks from wood serves to emphasize the possibilities of this new process of "cooking" wood and plastics. The Vidal tank, with the graceful curves, its smoothness and lightness, opens new vistas for this type of manufacture not only in the war effort, but in peacetime activity.

The droppable gas tank is designed not only to increase the flying range of aircraft in the ferry service to Europe, Africa and the south seas, but will be of material aid in increasing the range of tactical airplanes in combat. This is important because of the great distances United Nations' planes have to travel in reaching objectives. Ordinarily, the regular fuel load is not sufficient to make the journey and leave ample reserve in extended flying in combat.

The engineering of the Vidal tank presented many interesting problems. The patterning of veneers to make it leakproof, the creation of wooden molds around which the thin strips of veneer were laminated and the necessity of perfectly balanced baffles to check sloshing all had to be worked out with the thinnest possible shell commensurate with the load.

These tanks are designed to fit under the wings or fuselage and are attached in such way that in an emergency they can be dropped quickly, yet the pilot is able to switch to his regular fuel supply without interrupting the flow of gasoline to his engine.

Manufacturers in various sections of the country operating under the Vidal patents are planning to make tanks in large volume, ranging in size from 50 gallons to 160 gallons.



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Air Transport

(*Continued from page 128*)

Wildman and Lieutenant Commander Dorrell to assist in the commissioning of "VR-1"—Aviation Transport Squadron One. Meanwhile, in Washington, a small staff went into action. An operations manual was produced, large slices of it being unashamed steals from the best of domestic airlines manuals. The problem was the difficult one of establishing a transport system that would function with the precision and economy of the commercial lines and at the same time have the flexibility to serve with combat units whenever required. It would have to be versatile enough, for example, to assist in tactical operations with paratroops or glider-borne infantry.

The transport service that has sprung out of this humble beginning is simply a new airline very similar to a commercial line but minus such impediments as accounting and ticketing problems. The luxurious cushions of the airliner have given way to folding benches which collapse to make room for cargo. The benches, however, are not uncomfortable in spite of their curious resemblance to bed-pans. During the experimental days of the service, VR-1 designed a small cushion which would be suitable for passengers but would not add excess weight. It was decided to ask an admiral to "test hop" the benches with their new cushions. After traveling from Norfolk to Washington the admiral alighted and gave what was considered a definitive statement on the situation. "The cushion made my stern sheets feel fine," he said. "There was no suggestion of bed-pan discomfort." Following this edict, it was decided to make the cushions standard equipment on the transport planes. Some of the other luxuries of the commercial liners were also modified. It was regretted by several that hostesses had to be replaced by somewhat more hardboiled enlisted men, who joined the Navy as "transport airmen" to see the world from a plexiglas window. And, for the most part, the elaborate terminals of the private lines have their counterpart in the transport system as Naval Air Station or Reserve Bases, now grim with rows of trainers, fighters and bombers.

Since the transport service was designed to use existing Naval facilities wherever possible, the chief operating problems were those of co-ordinating rather than building. To each station was sent one officer and one or two enlisted men with previous airline experience. These were given the task of adapting Naval personnel and material to the service. The small crew thus assembled perfomed all the work of a way station, making reservations, which are handled through the control office by teletype or Naval radio, weighing and tagging baggage, checking in passengers, and preparing cargo for stowage—all done in the manner of the commercial line but minus, as previously stated, most of the nuisance of paper work. During the arrivals and departures a line crew borrowed from the personnel of the Naval Air Station fuels the planes and attends to the necessary checking. All of the transport activity is administered under existing Naval regulations and was originally placed directly under the chief of Naval operations.

Early in 1942, the transport service, along with other aviation activities of

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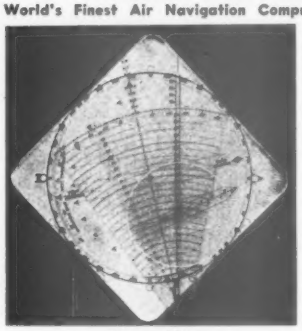

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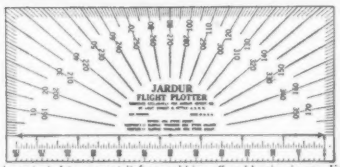

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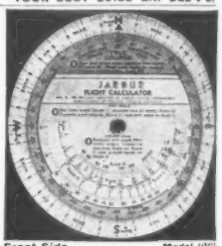

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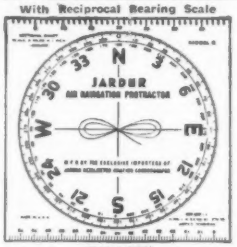

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the office of VCNO, was transferred to the new Aviation Division, directed by Capt. Frank D. Wagner, USN, a graduate of the Naval Academy in 1915. Captain Wagner was eminently fitted for his post, having been engaged in aviation activities since he earned his wings in 1922. He was commanding officer of the aircraft tender *Langley*, and of the famous Patwing 10, the Navy patrol wing in the Philippines at the outbreak of this war which carried the burden of air fighting there almost alone. Captain Wagner was relieved in September, 1942, by Captain J. P. Whitney.

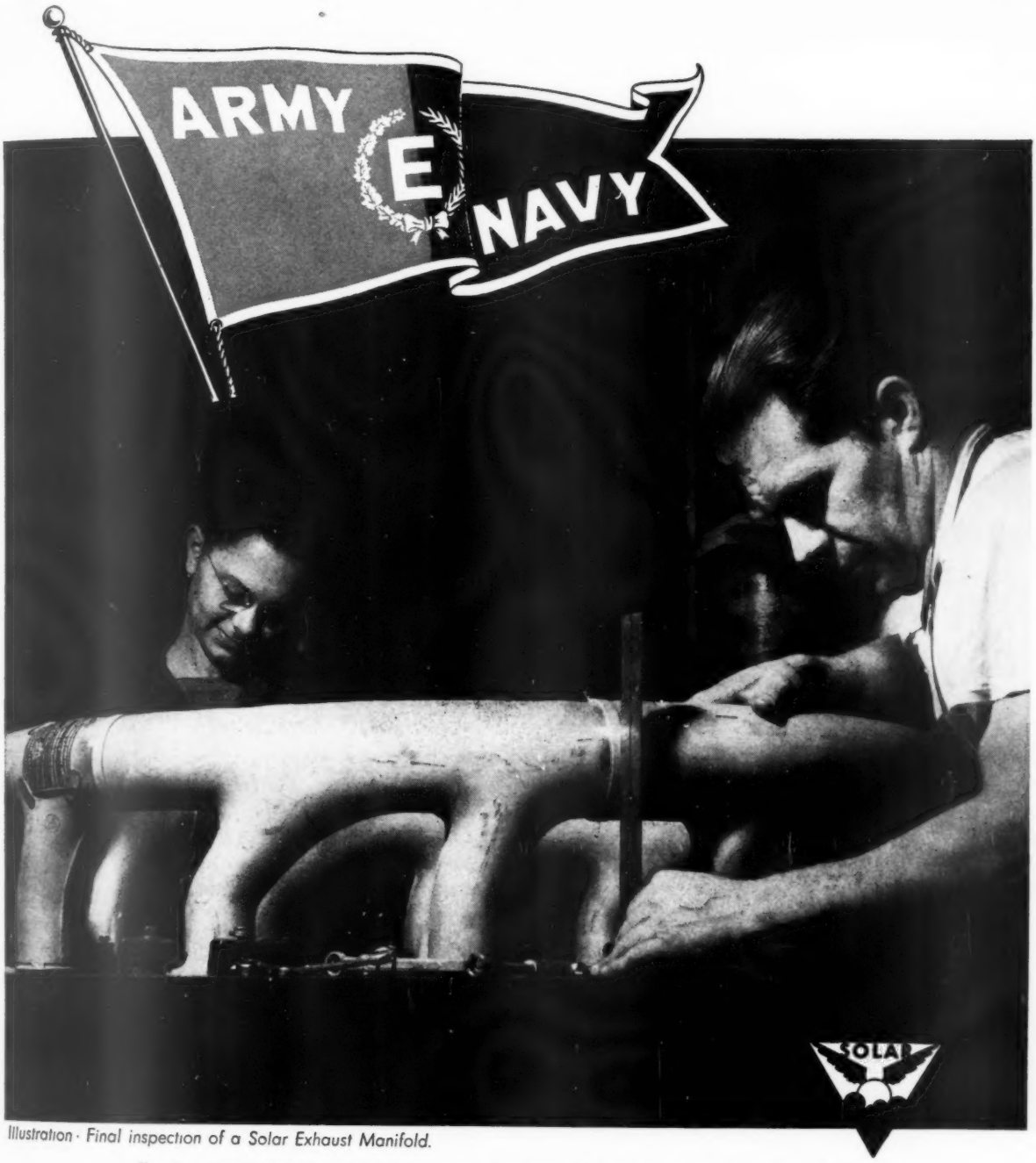
The Washington office of the transport service is primarily concerned with the activities of the squadrons, of which there are now three: VR-1 at Norfolk, VR-2 at Alameda, Calif., and VR-3 at Kansas City, Kan. Undoubtedly there will be more of these as the need for additional service grows. The schedules have increased in number very rapidly. In February, Commander Wildman of Squadron One announced three weekly flights between Boston and Corpus Christi, using R4D-1 aircraft, similar to the commercial DC-3 but stripped for cargo. By September this squadron was operating daily service between the Naval Air Stations at Argentia, in Newfoundland, and Trinidad, in the British West Indies. And very shortly schedules were worked out to Iceland and Rio de Janeiro. Squadron One also supplies Naval activities in Pensacola, New Orleans and Corpus Christi, by landplane, and Norfolk, Great Exuma Island and the Canal Zone, by flying boat. Squadron Two, in California, besides linking several important Naval establishments along the West Coast, extended its arms to connect with Corpus Christi, this forming a transcontinental service. VR-2 land operation now extends to the Kodiak Naval Air Station in Alaska. The schedules of all three of the squadrons, including that of the most recently developed unit at Kansas City, are expanding rapidly.

Most vital need for the service, now, of course, is to keep the Navy on the war fronts in fighting trim. The southwest Pacific, the most inaccessible of these fronts, presented the most hazardous schedule to be worked out. Since it involved extreme distances as well as amphibious operations, flying boats were obviously indicated. Accordingly, a number of Martin *Mariners* and Consolidated *Coronados*, stripped down for cargo hauling, were diverted from combat. It is planned eventually to supplement these craft with Curtiss *Commandos*, Douglas DC-4's, Sikorsky S-44's and the Martin *Mars*.

In addition to the terminals already mentioned, the cargo planes of the transport service are carrying supplies like ammunition, torpedoes, shell cases, spare engines and propellers, miscellaneous airplane parts and medical supplies to such places as Africa, New Zealand and the British Isles. While announcing no specific times of departures and arrivals, the Navy, in a recent news release on the services, stated that journeys to Australia, for example, which required three or four weeks by surface ships are now being made by air in three or four days. Besides the regular trips, special flights are made as needed to meet emergency requirements at any point.

One of the most cheering stories of the transport service is the splendid coöperation between the Navy and the commercial lines in this development. In keeping with its policy of using to the fullest all existing equipment, facilities and organizations, the Navy contracted with commercial lines to assist in the operation of certain routes. As a result of this, Pan American is flying Martin M-130's and Boeing 314's carrying Navy cargo and personnel between San Francisco and Pearl Harbor. South of Honolulu Navy aircraft, mostly PBM-3's, and in Alaska R4D-1's (operated by Pan American) are an adjunct to the far-reaching operations of Naval Air Transport Squadron Two. In the Atlantic, American Export Airlines and Pan American are operating special services for the Navy. As the fighting fronts expand and the need for more supplies grows, both the contract carriers and the squadrons will be enlarged. They are, in fact, being enlarged now as fast as new equipment becomes available and can be absorbed.

Naval aviation is playing a most praiseworthy part in this war of brutality and greed that has been forced upon us. Certainly it would be impossible to laud too highly those Navy heroes who have been spilling their blood to beat back the enemy from our shores. At the same time, we should bear in mind that it is the men of the transport service, unsung and anonymous, who keep them in the fight. END



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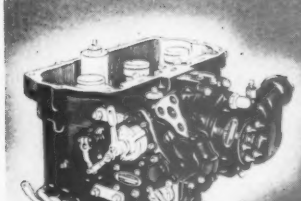

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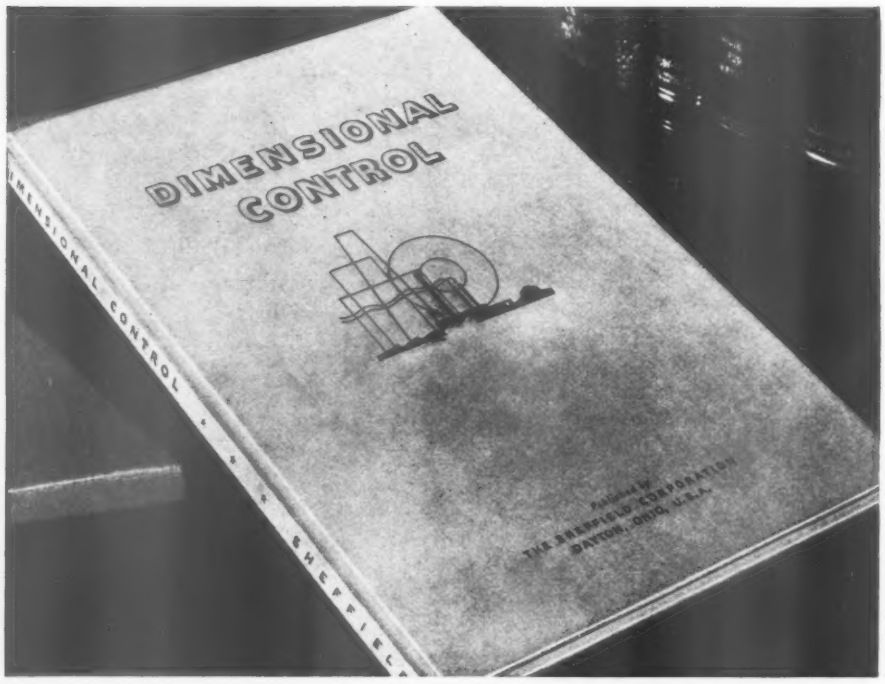

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The Fighter

(*Continued from page 84*)

get dark, the combat air patrol returns to the carrier.

There is dinner for us now, and the rehash of the doings of the day. We try to straighten out the reports of the pilots to find out who did what. It is hard to figure out who shot down what enemy planes, because we put more than one fighter on each Jap bomber and it is difficult for a pilot to know whether he or his partner set the fire. Sometimes nothing seems to happen after a pilot has attacked an enemy plane and then, unexpectedly, it suddenly bursts into flame. These matters are discussed and the happenings of the day are gone over again and again, for this is the shop-talk of the fighter pilot.

We turn in early, for the day has been long and arduous, and now that the excitement has abated, we are mortally weary in our bodies, although our minds keep turning over at about 2,600 r.p.m. until we finally fall asleep.

Months and years of training have led up to this day and much has been packed into it. The purpose of all this intensive preparation is, of course, to achieve control of the air. The phrase "control of the air" has been used by strategists, armchair and otherwise, to such an extent in this war that it is rapidly becoming one of the clichés which we are inclined to toss around in conversation but never seem to bother to define.

Strategists tell us that in all modern military operations it is necessary to gain and maintain control of the air. So far so good. But just what is control of the air? And how do we gain and maintain it?

Control of the air means the domination of the air over a specific territory to such a degree that our planes can operate there successfully and our enemy's planes cannot. If we can send planes over enemy territory which are unable to accomplish their missions and are forced to return home we cannot claim to have control of the air over that enemy territory.

Conversely, if the enemy cannot penetrate the air over our territory and accomplish his objectives, *he* cannot claim control of the air over that territory. That is Germany's present situation with regard to the British Isles.

Control of the air is gained and maintained by having aircraft available that can keep enemy planes away or can knock them down if they fail to stay away. It can only be maintained by aircraft which can cope with any type of operation attempted by any type of aircraft the enemy sends into the territory under our control.

In other words, it isn't sufficient that our dive bombers are better than the enemy's, or that our torpedo planes are better than the enemy's. To maintain control of the air, we must have planes that will knock down anything the enemy sends over. The fighter plane is designed and built from the ground up to accomplish this, as its specific mission.

The fighter is the specialist of military aviation. It carries no bombs, no torpedoes. It is not suited for long-range reconnaissance. Its function is to knock down enemy aircraft that comes within its range, and if this function is modified or expanded its usefulness is impaired and it is no longer a fighter.

The fighter performs its job because of its maneuverability, its rapid climb rate, its speed and its concentrated firepower. If its performance is reduced by making it carry additional loads of fuel, armament or equipment; it loses its ability to gain altitude advantage quickly, and one of its principal attributes—the ability to choose the time and angle of attack—is lost. This, in turn, impairs its facility for destroying enemy aircraft.

Fortunately, the principles of fighter combat have long been recognized by the United States Navy and, as a consequence, our operations have met with a signal success when we have been in position to put these principles into practice. Another demonstration of these principles is the Battle of Britain, which the British won simply because they had a better fighter than the Luftwaffe.

Every engagement of the war where fighter tactics have been employed in conformity with the correct principles of aerial warfare has shown the terrific advantage of the fighter in plane-to-plane combat.

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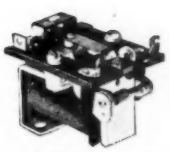

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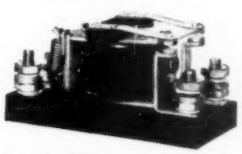

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Working with stainless steel, with aluminum, with bonded plywoods, they are turning out various types of complete 'planes. They are also serving others by supplying wings, fins, rudders, ailerons, stabilizers, fuselage sections, hydraulic equipment, and other parts.

Realizing, too, that America's air-offensive must never cease, but merely be turned into peacetime channels, Fleetwings already is planning for the changeover. Present plans promise that noteworthy aircraft developments by Fleetwings will continue for a long time to come.

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WOMEN AIRCRAFT ENGINEERS. Women were recently added to Fleetwings' engineering staff—the first in their department. And just as women on Fleetwings' assembly lines have proved there is no "weaker sex," these women engineers are proving that they can contribute vitally to the increasing output of the Fleetwings engineering department.

INFORMATION ABOUT production shortcuts and unusual aircraft developments at Fleetwings is told in a monthly magazine known as "The Fleetwings' Arrow." If you'd like to get a copy of this magazine regularly, merely write us on your company letterhead and tell us so. Send your request to "The Arrow," Fleetwings, Inc., Bristol, Pa. Of course, there's no charge.

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The performance of the fighter gives it the opportunity to choose the time, place and angle of attack. Its concentrated firepower is an additional advantage. There is also the advantage that the fighter shoots with fixed guns, for air pressure holds the wings of the plane in a vise-like grip, and if the plane is flown smoothly, more bullets can be poured into a concentrated spot and at a much more rapid rate of fire than can be done with free guns.

The apparent disadvantage of the fighter plane is its lack of range. It cannot operate as far from its base as the heavier planes — the high-level bomber for instance. The disadvantage is overcome, however, by operating the fighter from a mobile base—the aircraft carrier—which extends the fighter's range to a degree that enables it to accompany the bombers on their missions, and thus prevent the bombers from becoming "cold meat" for the fighters of the opposition.

At the outset of the war, there was an optimistic school of thought which held that unescorted bombers could operate successfully against fighter opposition, no matter how well equipped or how well manned. This school has now learned its lesson.

The Japanese apparently fell for this line of reasoning when they sent 20 unescorted bombers against us immediately after Pearl Harbor, in the face of adequate fighter opposition on our part. We shot down 19 of the 20 without their getting a single hit on any of our ships.

The big bombers that are blasting Europe today are no longer doing their work in solitary grandeur. The necessities of war have decreed that many fighters also go out on a mission over enemy territory.

In maintaining control of the air, however, the fighter has services to perform other than that of escort. We taught the Japanese a lesson on the fighter's worth, and, unfortunately, they learned all too quickly. Not only did they retaliate in kind; they promptly put their fighters fully to work by using them to control the air over landing operations, clearing the fields of our aircraft, strafing the field, shooting up planes on the ground and strafing defending ground forces on the beach.

It is fair to say that the Allied nations have been more successful with fighter planes in this war than have our enemies. The British have done better, with their fighters and ours, than the Germans and the Italians. We have had more success than the Japanese and, with all due credit to American inventiveness, our showing has been due as much to the ingenuity of our pilots as to the planes they fly. Credit is due also to the men who evolved the training system which taught our fighter squadrons their tactics and gunnery methods. Fortunately for the war effort, the Navy realized early that a pilot plus a fighter plane do not necessarily equal an efficient fighter. This is demonstrated when uninformed or inexperienced fighter pilots attack a plane such as the Army's B-17 and get shot down. As a consequence, every new possibility in the way of tactics has been explored, tested and developed, with the result that when our enemies could not be outmaneuvered they were outsmarted. The record that our squadrons have made in the face of the enemy's numerical superiority proves this point.

Our fighter pilots have demonstrated their value as escorts to a bombing force against an enemy land base. They have shown their ability to defend a carrier against counterattack. They have proved that unescorted Japanese high level bombers are no match for the defensive tactics of well-trained, well-equipped fighter protection.

It is a lesson I hope we never forget. The enemy never will.

END

The WAVES

(*Continued from page* 183)

First plans called for the induction of approximately 1,000 commissioned officers and 10,000 enlisted women into the Naval Reserve. Already this number has been greatly increased. On November 10 the WAVES had four training centers in operation for 2,800 students. Nine hundred probationary officers and officer candidates were in training at U. S. Naval Training School, Smith College, at Northampton, Mass.; an additional 300 officer candidates were undergoing training at the school's branch at Mt. Holyoke College, South Hadley, Mass. Sixteen hundred enlisted WAVES were undergoing courses for yeomen, radiomen and storekeepers at Indiana University, Bloomington, Ind.; Oklahoma Agricultural and Mechanical College, Stillwater, Okla.; and University of Wisconsin, Madison, Wis. On December 15 an indoctrination center was opened at Iowa State Teacher's College, where 1,000 enlisted WAVES started basic Naval indoctrination training. This course lasts one month, at the end of which there will be selected, through observation and aptitude tests, personnel for further training in such fields as aviation machinist mates, aviation metalsmiths, aerographers mates, parachute riggers and Link Trainer instructors. On January 15, a group of 400 enlisted WAVES will start general basic Naval training at Georgia State College for Women at Milledgeville, Ga.

"Class V-10," as the enlisted women's group is called, covers every field in the Navy in which it is deemed practicable to utilize the services of women. The first group of yeomen, stenographers and radio operators have already finished training and have been assigned to duty. New groups are under instruction. Additional schools are being set up to train the technical ratings mentioned previously. The following alphabetical list is a good indication of the jobs Uncle Sam wants his nieces to take over:

Bakers
Chauffeurs
Cooks

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TURCO PRODUCTS, INC., is helping to speed up War Production with their Specialized Industrial Chemical Compounds designed for use in every Department of the War Industries.

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Line assistants (assisting ground work in take-off of planes, signaling, clearing fields, etc.)
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Messengers
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Pharmacists (assistants to Medical Corps. Requires training in advanced first aid and home nursing)
Photographers (includes land and aerial photography. Knowledge of developing, printing, training, sorting, splicing, assembling layout and background desired. Experience needed as commercial artists, mechanical draftsman, inkers, opaquers and animated cartoonists)
Stewards
Telegraph operators
Telephone operators
Tower workers (stationed at control towers at air stations)
Waitresses.

The need for women with previous training in the fields listed above is urgent. The Navy is preparing to give whatever additional instruction is necessary and where previously experienced persons are not available, the Navy will train them from the ground up.

Briefly the requirements which must be met by applicants for enlistment in V-10 are:

Be at least 20 and not over 36 years of age. Be unmarried at time of appointment and agree not to marry prior to the completion of the indoctrination and training period. Not have children under 18 years of age. Have a good reputation in their respective communities. Be a high school or business school graduate or have had courses at business school and subsequent business experience adequate enough to be considered as the equivalent to a high school education.

The rate of pay is the same as for men and is in addition to quarters and food. When subsistence and quarters are not available, an allowance to cover them is furnished by the Government. An amount up to $200 is allowed to cover the purchase of prescribed uniforms. A careful study of the enlisted pay table below should be interesting to all who have been paying for their own food, housing, clothes, recreation, medical and dental treatment.

Rating	Monthly Base Pay
Chief Petty Officer, permanent appointment	$138
Chief Petty Officer, acting appointment	126
Petty Officer, First Class	114
Petty Officer, Second Class	96
Petty Officer, Third Class	78
Seaman, First Class	66
Seaman, Second Class	54
Apprentice Seaman (starting pay for	

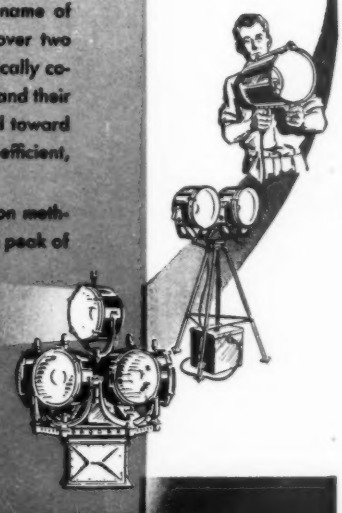
(Continued on page 254)

LIGHTING THE WAY...

Our efforts in "Lighting the Way" to a new approach to the problem of production by assembly and sub-contracting are indicated in the results achieved. We are profoundly grateful that our methods in collaboration with sub-contractors and our joint accomplishments have merited the coveted Army-Navy "E" award. Such an honor will be a constant inspiration to dedicate even greater efforts to the American cause and the Victory that will be won!

In the production of airport, aircraft and marine lighting equipment that bears the trade-name of LIGHTS, INCORPORATED, the efforts of over two hundred manufacturers have been scientifically co-ordinated. Thousands of skilled mechanics and their tools, which might otherwise never be used toward the war effort, are now directed upon an efficient, *Victory-assuring* program.

Just as certain sub-contracting production methods were developed and brought to a high peak of efficiency by Lights, Incorporated, *so also* were the products of the company —which include all types of standard and specialized lighting equipment, many restricted products for use by the Navy, Army and Ordnance, and the new Butex synthetic rubber.



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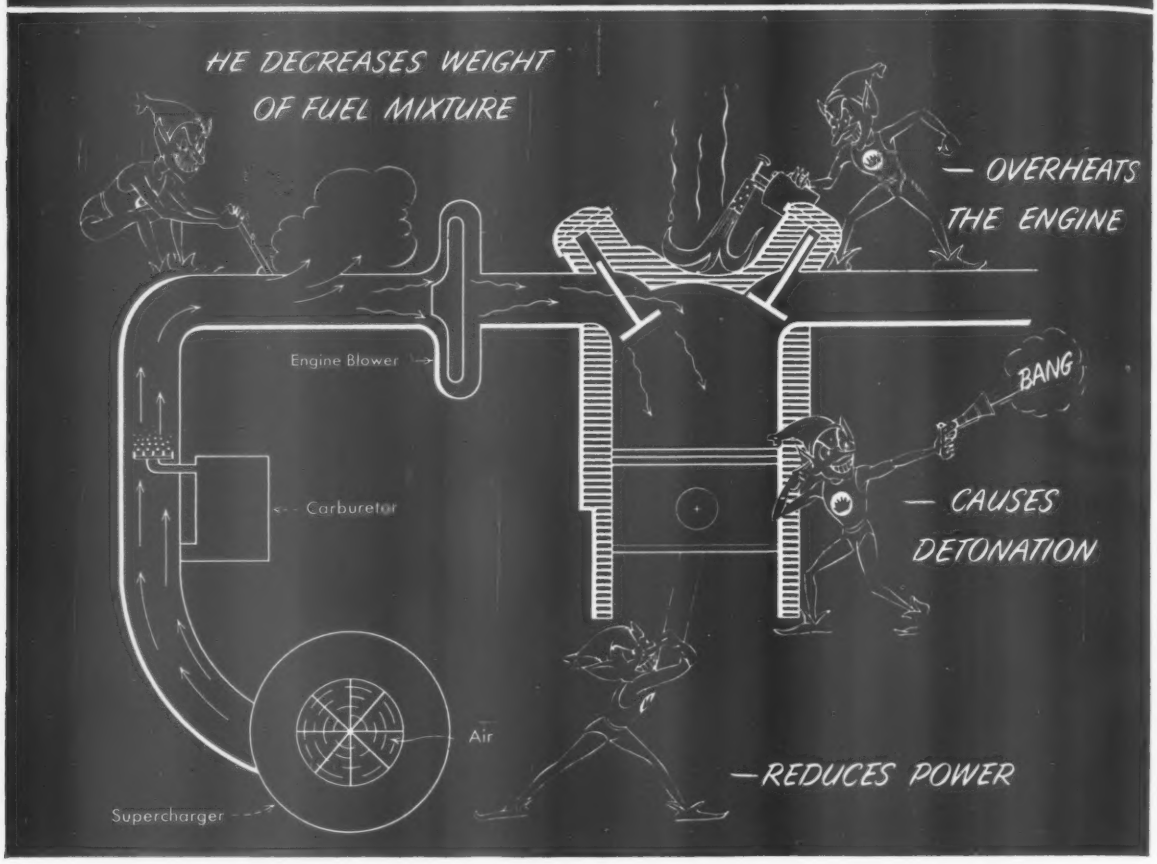
Hot air is the supercharger "gremlin"...



AiResearch Intercoolers *provide control that helps raise critical altitudes*

THE SUPERCHARGER in compressing air *heats* it considerably. And as increasing altitudes require more and more air compression—this heat makes it tougher for the power plant to maintain its normal rated power. Thus hot air becomes a "gremlin" that reduces the critical altitude of the power plant.

How well AiResearch Intercoolers have curbed this heat "gremlin" is now proven. Today, on every Allied front, these Intercoolers are helping increase the density of carburetor air intake—helping the power plants of American-made warplanes to deliver *added useable power at critical altitudes.*

Ruggedness is an outstanding feature of the AiResearch Intercooler, despite its extremely light weight. It is manufactured of heat-treated aluminum alloys. Tubes are mechanically fastened and jig assembled—they stand up against back-fire.

And, the entire assembly is anodized for protection against corrosion ... another reason why the AiResearch Intercooler provides freedom from maintenance trouble.

AiResearch Intercoolers are manufactured in flattened or round tubular units ... adaptable to every shape and size requirement. And the intercooling experience of the engineers who developed them is available to all aircraft manufacturers. Inquiries are invited

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"MY son did not volunteer for the service to fight this war alone. He volunteered because he thought we were all going to fight and win together. This is why I gave up housekeeping to teach aircraft mechanics at the Dallas Aviation School. I thought winning the war was more important than washing dishes."

These are the words of Mrs. Roberta Finney of Kansas City, Kansas. She is thirty-six years old; a mother who enrolled at the Dallas Aviation School when her only son volunteered for combat service. She studied aircraft mechanics because she wanted to train herself for a war job—a job held by a man needed for active duty. Her courage, enthusiasm and intelligence won her a position as an instructor at the Dallas school the day she completed her course.

"If every woman with a son, brother or sweetheart in the service REALLY wants to see him come back home, she will get in the fight with him and work behind the lines. Every woman who trains herself for a job as an aircraft mechanic, radio operator, instrument technician—or a hundred other things—releases a man needed for combat service."

"The longer we sit around and ask—'What can I do?'—the longer it will take to win this war. And the longer it takes to win, the fewer chances there will be for your son and mine to come home."

Every man and woman in the United States is needed to help win this war.

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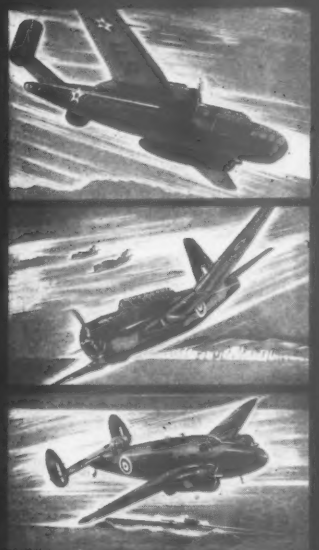

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BILTMORE
David B. Mulligan, President
MADISON AVE. AT 43RD ST., N. Y.
Direct elevator and stairway connections with Grand Central

(*Continued from page 249*)

all candidates for enlisted ratings) 50

The requirements for officer candidates, "Class V-9," are exactly the same as those for enlisted, with the exception of educational and physical qualifications, both of which are higher. All applicants for commission as technical and administrative officers must be not less than 20 and not over 50 years of age. They must possess a baccalaureate degree from an accredited university or college, or in lieu of the degree, two years' work toward a degree successfully completed in an accredited university or college, as well as two years of business or professional experience in fields acceptable to the Navy. Two years of high school or college mathematics must have been successfully completed by all candidates.

After a month's basic indoctrination, officers candidates are classified in two groups; some are given probationery commissions in appropriate ranks and continue with a second month's indoctrination, at the end of which time they are regularly commissioned. Those in the second group are appointed midshipmen and begin a three-month's training course in communications, upon successful completion of which they are appointed to appropriate commissioned ranks.

The Navy is making urgent calls for women trained in many fields: aeronautical, civil, industrial, chemical, radio and electrical engineers; accountants; statisticians; psychologists; librarians; meteorologists; mineralogists; geologists and astronomers are but a few.

The response to the nation's call for help is being answered by serious-minded women from all portions of the country. They have shown themselves eager to do whatever is possible to win the war. This attitude as well as the aim of the Women's Reserve of the Naval Reserve was succinctly and comprehensively expressed by Lieut. Comdr. Mildred McAfee, who, upon accepting her commission stated:

"I have been offered a high honor and a great responsibility. As an individual I should not venture to accept either. I accept the responsibility as a representative of the women of America who welcome each new opportunity to render service to the nation.

"The WAVES are only one group of women who are trying to serve the nation through helping the Navy . . . asking to be called upon for hard work and the privilege of service."

END

Engine Order

THE Aircooled Motors Corporation of Syracuse, N. Y., has received additional orders for unrevealed quantities of Franklin aircooled aircraft engines from both the Army Air Forces and the Bureau of Aeronautics, Navy Department.

The type of planes in which these new Franklin engines will be used was not revealed, nor were any details as to the size or construction of the engines themselves, except that they are said to be of the horizontally-opposed type.

Technical Training

(*Continued from page 176*)

To a layman, a mechanic's training is a complete enigma. Smallwood, like most of his mates, doesn't find it too difficult. Briefly and thoroughly he progresses through the course. That may mean covering wings with fabric, repairing holes and tears, splicing cables and adjusting brakes. It will include inspecting hydraulic systems and tightening propeller blades; learning the grades and properties of lubricants and the complex principles of combustion engines.

Finally he gets out "on the line" with fighter planes and patrol bombers to prove his ability and versatility. The Navy doesn't believe in working on obsolescent equipment. It assigns, for training purposes, the best possible planes to give its technicians the best possible experience. By the time Smallwood has his rating he will be a top-notch mechanic, able to take a plane apart and put it together again. Eventually, he and his fellow trainees will be asigned to just that job—handling a combat craft somewhere in the battle area.

On the other side of the Pier, the metalsmiths are at work. Their preliminary training is the same—a comprehensive coverage of the care, handling and proper use of hand tools, power tools and shop equipment, with a view toward more capable operatives and the elimination of all accidents. Then they branch into all phases of metalwork in the maintenance and repair of an airplane by the presentation of fundamental metal-work material and methods.

In short, the trained AMM will concentrate on the sheet metal and welding shops. He will spend hours at soft soldering, power tools and aircraft metal work—he will learn welding and cutting, finishing and heat treating. On planes withdrawn from the battle zone, these men take their tests—their marks depending on practical ability and application.

Switch the spotlight now to Norman, Okla., where, in less than four months, the ordnance school graduates its AOMs to active duty with the fleet.

An ordnance man is "responsible for everything that a plane fights with," in the eyes of the Navy. His concern is firepower. When a fighting pilot is dogfighting a Zero, his guns must go off; when an SBD dive-bombs an enemy cruiser his bombs must be armed to explode; when a TBF launches its torpedo, the tin fish must blast its way truly home. An ordnance man must always be right. On his technical ability hangs the lives of the men in the plane and victory itself.

When the Navy talks about firepower in its planes, it is talking chiefly about its .30 and .50 caliber machine guns. An ordnance man must know them as a watchmaker knows his springs. He must be able to dismantle, assemble, install, clean and maintain his Brownings and do these jobs with unfailing efficiency.

HEATH
IN THE SKIES FOR A THIRD OF A CENTURY
To "get there FIRST with the BEST" is an American tradition. Our nation's leadership in transportation started with the steamboat and the railroad, followed by the automobile — and then the first airplane. In true manner, our country could not be content to rest on the laurels of Kittyhawk alone. "Yankee ingenuity" was further challenged — and will meet this challenge — as long as the world rides on wings. Since the first decade of flying, the name of HEATH has been inseparably linked with airplanes and their development. The history of HEATH is the history of light plane progress. And in the present decade, the entire facilities of this veteran concern are devoted to the manufacture of aircraft components. HEATH Tailwheels, Windshields, Airphones, Radios, Skis, Pontoons and Accessories guarantee safer and easier flying for today and greater advancements in the brilliant future for all of us in the skies of tomorrow
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He must be able to install and align the gun sights, to synchronize firing through propellers.

An ordnanceman's duties cover a lot of territory. He must do everything but shoot the guns—and he may even do that. He must have a knowledge of construction of bombs and fuses, proficiency in small arms, preparation and maintenance of aerial towing equipment such as towing sleeves for target practice, and know and install the whole gamut of pyrotechnic incendiaries—float lights for taking drift, rockets for identification, and parachute flares for lighting enemy targets.

The fourth big classification of Naval aviation technicians is radio. An ARM is no longer just a "Sparks," a man who sends and receives messages. He is that, certainly, but he can be and often is gunner. Godfrey and other radiomen have proved their mettle in dive bombers and torpedo planes in this air war. The honor roll of heroes commemorates the jobs they have done and are doing.

At Jacksonville and other schools these men receive their training, some 560 hours of work expeditiously packed into 14 weeks. At long tables, students with phones on their ears work steadily translating code to readable language. At the end of the course an ARM/3c will be able to receive up to 24 words a minute. They may not have to copy it that fast with the fleet, but they will be able to, if an emergency arises. They must know how to type, too, at the rate of 40 words a minute—radio procedure, such as calling a station or keeping a log; practical operation of radio equipment, such as starting and regulating all radio equipment on a plane, tracing and servicing the electrical circuits; and maintenance, with its care and use of tools and assembling and disconnecting radio apparatus from and in a plane. ARMs also have the same basic training in signal flags, semaphore and blinkers as do other technicians.

Some of these technicians—those who are under 5 feet 10 inches, weigh less than 160 (maximum physical specifications to fit into a gun turret), and are otherwise qualified, go on to primary gunnery school. Here, for a full month, they learn how to become an aerial gunner. With synthetic devices, in the classroom and out on the ranges, they learn the principles of good shooting and how to put that knowledge into practical operation.

In such schools every effort has been made to reproduce situations these gunners will face in battle. They start first with trap and skeet shotgun firing to learn the "lead" principle, progress to a shotgun with spade grips, and then go on to their real weapons—.30 and .50 caliber machine guns. Finally, from trucks speeding down a race highway, they pump bullets into towed sleeves racing about circular tracks. As graduates they receive operational training in combat craft before being assigned to active duty in flight crews.

Under the Navy system, these men are the backbone of aviation—the mechanics, radiomen, ordnancemen — doubling as gunners. There are others, too, specialists trained in advanced radio, in lighter-than-air operation, in bomb-sighting, in parachute materials, in photography, in aerography and other functions that necessarily cannot even be mentioned. There will soon be hundreds of thousands of them, trained to the minute, ready and able to do a job—for America during the war and in America when the war is won.

Rubber Wires Next?

STATIC-CONDUCTOR tires, made of a new rubber compound, now ground collected electricity when a plane lands.

Texas Ahead

MORE Texas cities are served by regular air transportation than are those of any other state. Airlines touch 16 communities there, while the closest runner-up is Florida, with 13. Third comes California, with 11.

Armament

(*Continued from page* 191)

item began to appear in the specifications of smaller airplanes.

Then suddenly war broke out in Europe. Here was a vast proving ground upon which the results of the theorists' dogged fight could be tested. The outcome of these tests might well effect the whole future of the nation. The armament decisions had been made and the whole aircraft program was already committed to one line. Changes could be made later on, but such changes would take months and months to accomplish. The armament program would become confused and, during the changeover, battles might be fought and lost which would entail the lengthening of the war by years, if not its complete loss.

Needless to say, the opening phases were watched and studied closely. It soon became apparent that the question of armament had perplexed the British and the Germans as much as it had the United States. Apparently, they too had studied the problems involved, yet the answers determined by their engineers differed from those found over here.

The Germans were sold a bill of goods by the speed merchants—their bombers were only very lightly armored and had the barest minimum of guns—speed, supposedly, being their prime defense. This solution, in the earlier stages of the war when they were sweeping eastward across Poland and westward across France, seemed to be adequate and the turret conscious men in this country were made the targets of many a diatribe. But when the Germans turned toward the sea, and the Battle of Britain was fought and lost, the bill of goods they had been sold was exposed as worthless. Once again it was proved that the bomber cannot outfly the fighter, and their solution—speed—crashed flaming to earth in the form of more than 1,000 bombers.

★ ★

ARMY E NAVY

IN GRATEFUL ACKNOWLEDGMENT

of the honor conferred upon our organization, we take this opportunity to pay a well-earned tribute to the mighty Air Arms of the United States Army and Navy.

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- ✓ 16. Installation Flap Doors

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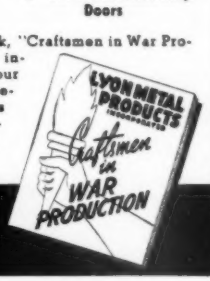

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BEFORE a single word of this book was printed, it was tried out on the young men and women in the schools of a great city. The result is a book unlike any other on planes and flying—a book you can rely on to guide you to the aviation career that is right for you, then give you the right start in the branch you choose. Everything you need to know before actually flying is in this book, clearly, simply, excitingly described in words and pictures.

A few of the subjects covered are: Army, Navy, and commercial aviation . . . Basic laws of physics affecting flight . . . Controlling the airplane . . . How airplanes are built . . . Airplane maintenance . . . Airplane spotting . . . Engines and Propellers . . . Fuels, lubrication . . . Carburetor, supercharger, ignition system . . . etc. *332 Pages, 174 Illustrations and Diagrams.*

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By A. HOOPER

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NAME

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The Germans took this lesson to heart and turned to more and heavier guns. But they were faced with tremendous difficulties. They had built up huge stocks of the under-armed planes which could not be scrapped willy-nilly. They were needed and needed desperately for the coming campaign in Russia. Yet they could not be sent into the air against such formidable opposition as they found in the *Hurricanes* and *Spitfires* without additional tremendous casualty lists. The airplanes might be replaced quickly, but the drain on the flying personnel was terrific.

So, very shortly after that fateful battle had been lost, the German planes began to appear with increased armor and with guns sprouting from all conceivable angles. A few manually operated guns of approximately .60 caliber turned up but soon disappeared, due undoubtedly to the fact that they were unmanageable by the gunners. There are signs that they already realize the limitations of this "porcupine" principle for they are now experimenting with the turret. But this cannot appear in quantities for a long time, for they still have a backlog of airplanes which cannot be changed to accommodate such equipment. Furthermore, there is evidence at hand which leads to the belief that the Germans' research and development along these lines have been, in the past, only lightly considered. It appears that they have been badly out-guessed and out-thought.

The British, upon their entrance into the war, conservatively tried two solutions. Some of their bombers were similar to the Germans' planes in that speed was their prime defense. But there were others equipped with turrets which, until that time, were not too highly regarded, due to their lower performances. The former soon disappeared abruptly from the picture. In the British attack on Wilhelmshaven in the early days of the war their losses exceeded 75 per cent and the fate of the speed bombers was sealed. They were relegated to training service. The turret-equipped airplanes, however, proved their worth. Time and time again they fought their way to and from their targets successfully; soon they were the backbone of the bomber command.

When the war struck us, therefore, the United States armament engineers already had two of their predictions proved—armor could be installed which would stop small bore bullets, and the turret-mounted gun would prove to be the most efficacious weapon for bomber protection.

But what of the ".50"? That gun is only beginning to tell its story. It made its debut but a short time ago when it began to stutter in the Far East and over the battleground of Europe. Its story, however, is being told every day in the terrific ratio of enemy planes which are destroyed for each one of ours lost. Aircraft armor, within practical limits, is no protection against it. "The .50 tears 'em to pieces," as one pilot put it. Pilots who have once flown with the .50 and have seen the destruction it deals out would never return to the .30. The gun has not been sold to the service; it has sold itself.

What of the future? Secrecy prevents any details from being issued. But you can rest assured that the far-sighted men who gave us the weapons discussed above are not sitting back with the feeling that their work is done. Already they are dissatisfied with what we have. They know that aircraft performances are still going up. They know that these increased performances will allow the installation of still heavier armor. And even now they have the answers ready and waiting for the first signs of such a development. Guns of heavier caliber, guns with increased muzzle velocities, guns with a wallop that makes even the .50 look mediocre, are there. More heavily-armed turrets, providing far more accurate shooting at longer ranges, are today waiting for an airplane in which they can be installed. In addition, brand new weapons have already been developed and are just now entering combat. Others are on the drawing boards and at the proving grounds. Yes, you can rest assured that those men aren't sleeping. Day and night they are striving to keep our present pre-eminence in combat weapons, striving to give us the firepower that will win the war.

END

CAB Safety Bulletin

A RECENT issue of the Civil Aeronautics Board's safety bulletin emphasized that "safety consciousness is a form of patriotism," and urged, "if you do not value your own life, at least be patriotic enough to conserve your ship and your ability to help win the war. Do not take unnecessary chances and, above all, try to avoid collisions because when a collision occurs two airplanes are lost to the war effort instead of one."

The CAB points out that constant alertness, courtesy, and compliance with certain common-sense traffic rules should help you be patriotic. These rules are:

1. Observe local field traffic rules.
2. Always make sure there is no danger of collision before taking off.
3. Circle an airport to the left, unless local regulations specify otherwise.
4. Always maintain a straight approach course for the last 1,000 feet before crossing the airport boundary.
5. Follow the circuit rule when making a contact flight within three miles of the center of an airport if you are below 1,500 feet.
6. Traffic coming into or leaving a control airport takes precedence over traffic within the control zone of the airport.
7. When starting or running an airplane engine always station a competent operator at the engine controls within the plane, have chocks under the wheels, or an adequate parking brake fully set.
8. When approaching a landing area where there is a congestion of people, planes or autos proceed with caution and make sure that the area is "open."
9. Pertinent today is the CAB advice; on take-offs and landings over any high explosive danger area always make sure that an emergency landing can be made outside of such area.

OUR effort in the war is small in size but big in volume. And each single part is vital in a plane's instant response to its hydraulic controls . . . essential for a constant supply through gas and oil lines, etc. Precision beyond anything usually associated with mass production is the quality that earned us the respect of the Aviation Industry.

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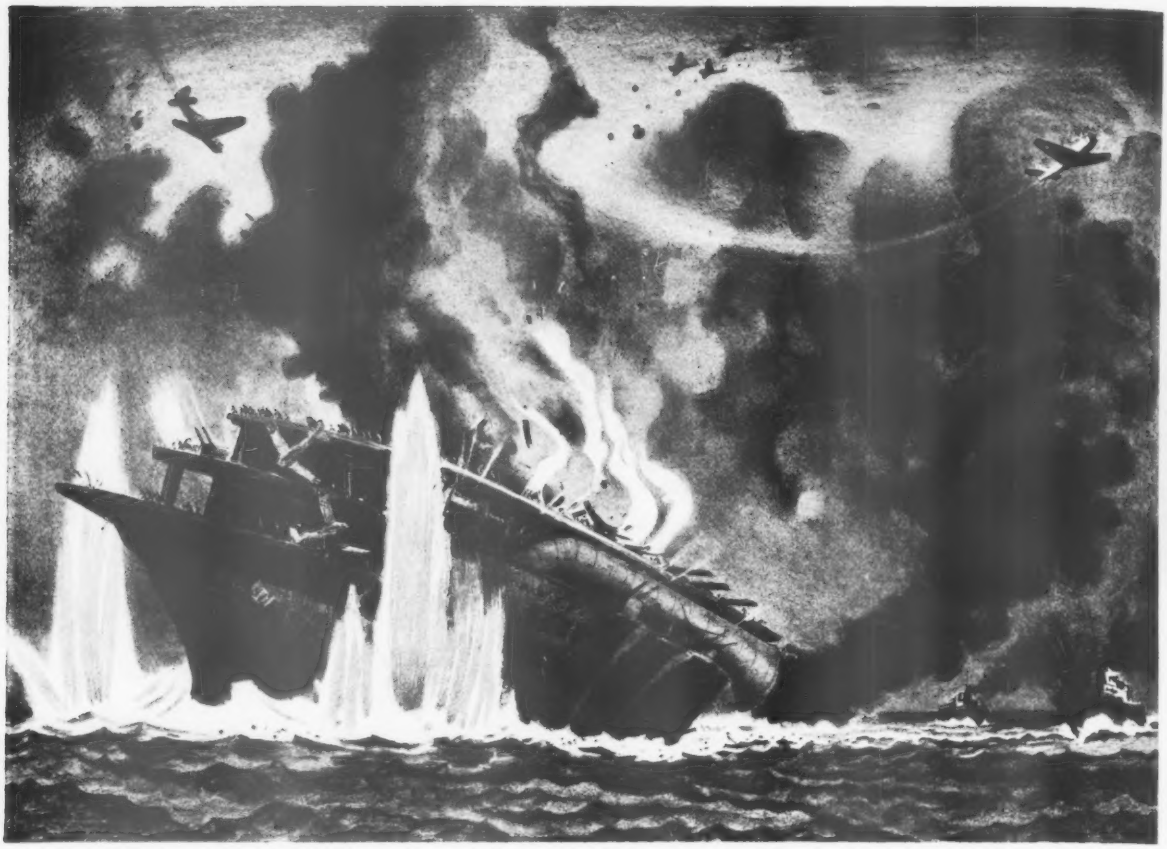

AMERICAN BOMBERS SINK JAP CARRIERS!

Pictured here is a Japanese airplane carrier, with its characteristic horizontal funnel, after a direct hit by an American bomber.

"More planes plus more carriers" is America's answer to the Axis powers. As the accumulated force of America's equipment and training become felt—we shall begin "to hit the enemy and hit him again."

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Tulagi Island (center foreground), Jap stronghold in Solomons, after Navy bombed its fortifications.

'HOT SPOT'

The Solomon Islands, battleground of the Pacific, form a strange setting for bitter aerial warfare.

FEW Americans know much about the Solomon Islands. Before the war started, students of elementary geography were vaguely aware that the group lay several hundred miles northeast of Australia, that they were inhabited by black, kinky-haired men who reputedly had a habit of eating each other, and that they were under some sort of protectorate of the British. Beyond those few facts, the Solomons were largely a mystery.

The war in the South Pacific, however, has brought the Solomons into sharp focus. The Navy and Naval Aviation, as well as the Army and the Marines, are currently occupied in a hard-fought and prolonged struggle to wrest these strategic islands from the Japanese, who moved into them soon after the war started. In spite of the intensive ground fighting, the battle for the Solomons is largely an air battle, with Navy and Marine combat planes and Army bombers from General MacArthur's command daily roaring over the Jap positions in an effort to blast a path for Marine ground forces.

Since it is in this theater of war that Naval Aviation is playing its most im-

(*Continued on page* 303)

Carrier-based aircraft successfully bombed gun emplacements and antiaircraft batteries on Tanambogo Island.

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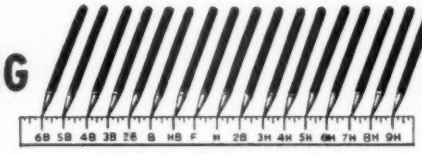

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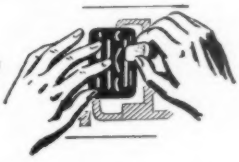

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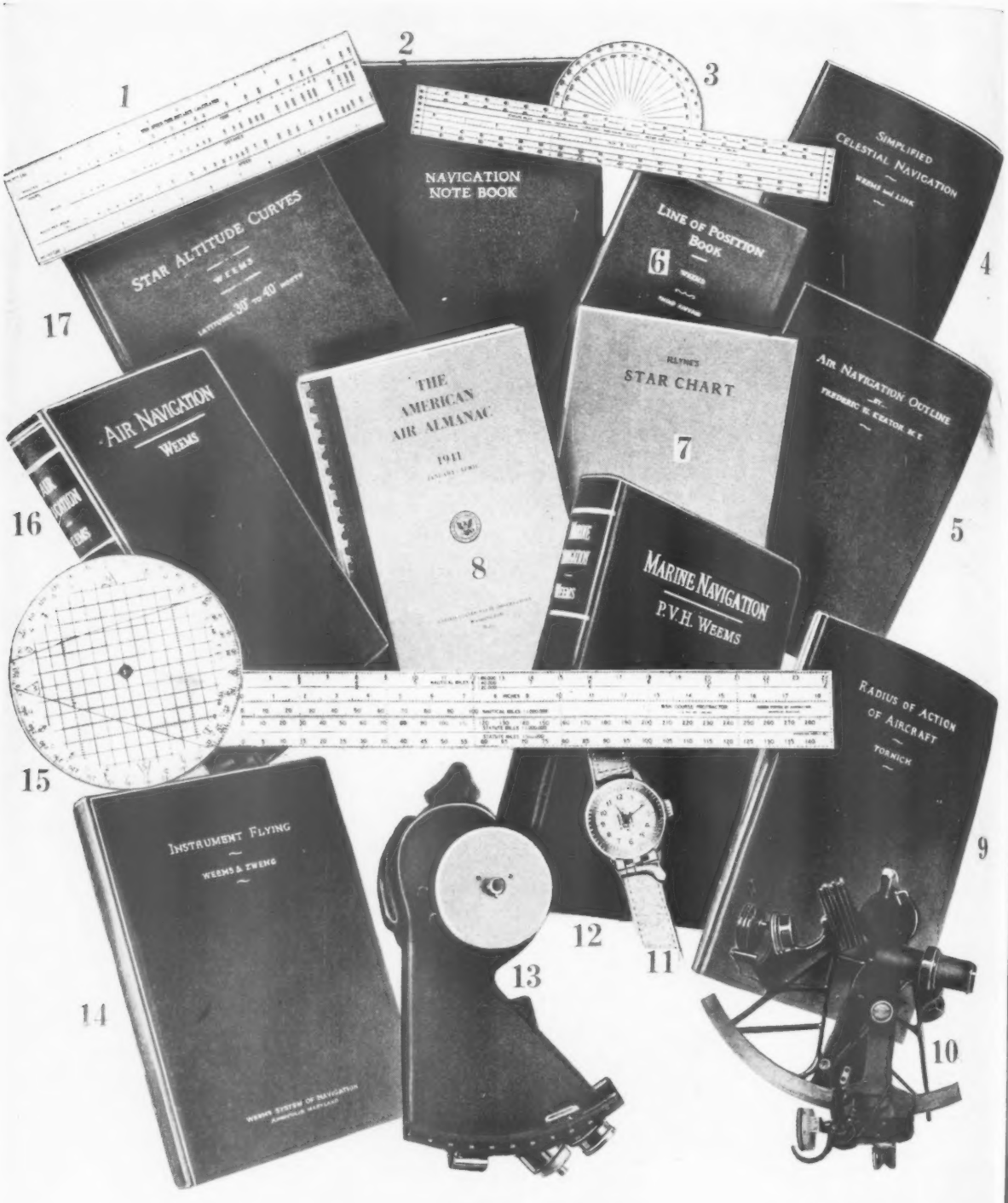
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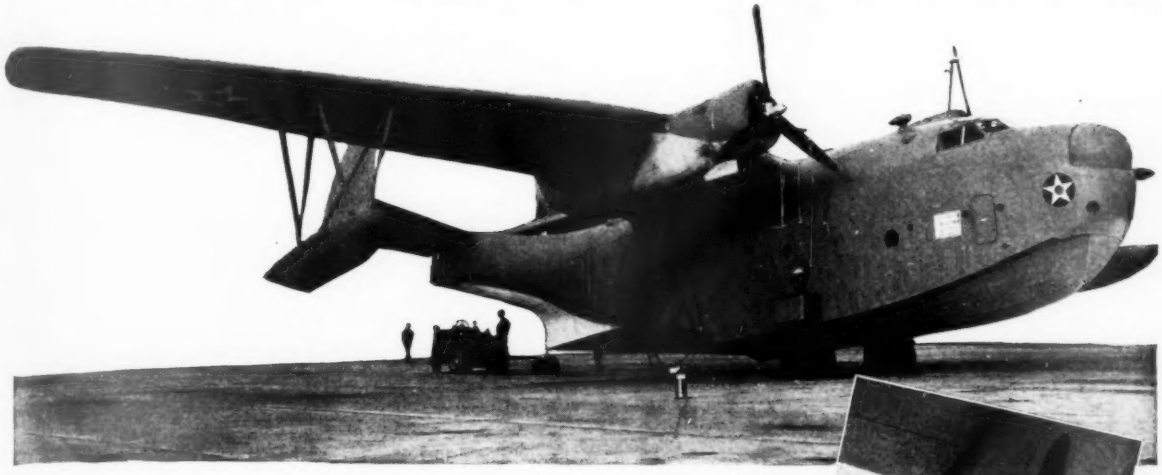

On Hayes Beaching Gear Wheels with Expander Tube Brakes, the Navy's flying boats roll ashore—at home bases, as they do out across the seven seas, on the sands and runways of the world's war fronts.

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Illustrated:
Martin PBM (*top*)
Consolidated PB2Y (*right*)

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Lighter-Than-Air

(*Continued from page* 184)

we had practically no blimps, the anti-submarine weapon par-excellence. We had only one airship base, Lakehurst, N. J., and a handful of personnel, many of these scattered throughout the Naval service.

Commencing early in 1942, strenuous measures were taken to obtain blimps for our sea frontier forces. Congress authorized 200, a part of which have been delivered and are in service. Bases along our coasts are under construction, and several have been completed. Our helium production plants and means of distributing it are in process of radical expansion. And the toughest problem of all, that of supplying competent crews to man the ships, has been tackled by expanding the training activities, and shortening and intensifying the courses. But the small nucleus of experienced airship personnel is being so diluted with new trainees that for months to come the general average of experience and competence of our crews will necessarily go down.

All phases of the airship program are retarded, moreover, by shortages of labor and critical materials in the industrial plants producing airships, base equipment, helium plants and tank cars.

To summarize, great effort has been expended in the past year to place blimps on the coastal "firing lines." Those which have been so placed have been of high value in the anti-submarine campaign. Nevertheless, it has been a slow process, from "scratch," and the type is capable of a far greater contribution to the war effort than it has been permitted to make to date.

The performance characteristics which make the blimp a valuable anti-submarine type are:

Range of speed from zero to about 67 knots.

Three dimensional maneuverability.

Good weatherworthiness and sea-keeping ability.

Relative immunity to the handicaps of low visibility.

Long cruising range.

Obviously, nothing can now be published as to the technical details of anti-submarine patrolling and escorting, or the tactical doctrine in development of contacts and attack. Neither can the armament be described, nor the results of operations in terms of numbers of submarine sinkings. Suffice it to say that the Navy is now energetically pushing the airship program. During the new year we hope to obtain a reasonably adequate number of blimps in our coastal forces, manned by as competent personnel as the circumstances will permit.

Another type of lighter-than-air craft is being utilized by the major belligerents in this war, the "barrage balloon." Moored balloons have had a long history. Napoleon used them in the "world wars" of the turn of the 19th century for artillery and tactical observation. Count Zeppelin observed balloon operations while with the Federal Army of the Potomac in our Civil War. "Kite" balloons were used by all armies in the war of 1914-18; our battleships were provided with them for spotting gunfire. In this war, the airplane has supplanted this branch of lighter-than-air in its traditional role of getting an observer aloft. But constructed in smaller, non-man carrying sizes, it has a new role; the barrage balloon is being utilized in large numbers by all belligerents, as anti-airplane "entanglements," in the defense of fortresses and other strategically important localities.

The press has carried stories of their employment in merchant ship convoys. A balloon barrage tends to keep attacking airplane formations at higher altitudes than they might otherwise maintain.

The largest type of Naval lighter-than-air craft now exists only on paper—the airship plane-carrier. The two prototype airships of this class were the *Akron* and the *Macon*, which were successfully operated for several years. Development of this class was given up when these vessels were lost, although the circumstances of their loss had little apparent bearing on their utility in Naval warfare.

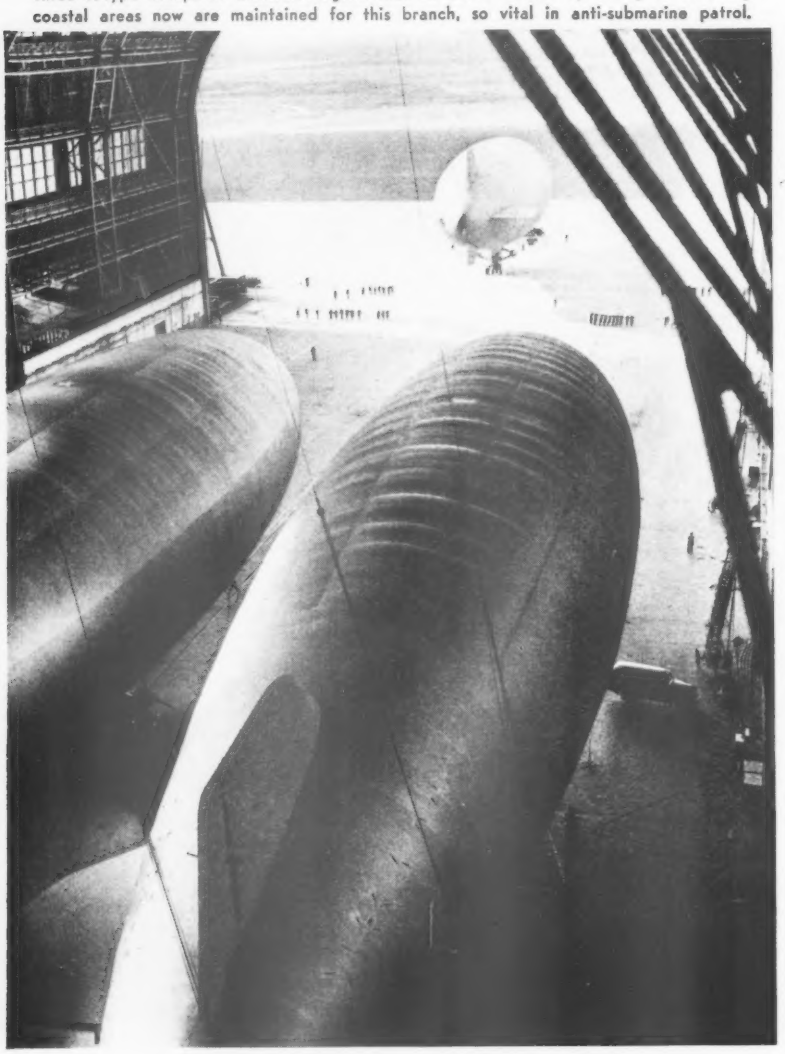
This class of lighter-than-air craft is an "engineering descendent" of the German Zeppelin type, which had a long record of successful operation as merchant vessels, as well as naval reconnaissance craft in the last war.

The surface plane carrier has, of course, demonstrated its utility in this war. The proponents of the airship plane-carrier believe that several squadrons of them could also have been of enormous value to our Fleet commanders in the Naval campaigns to date.

The large cargo-carrying airship is also hypothetical at the moment. Airship men believe, however, that it would be useful if constructed in reasonable numbers, by mass production methods, to carry important cargoes over land and sea areas where surface transport is difficult and

(*Continued on page* 272)

Three K-type blimps at Lakehurst lighter-than-air base. Other operating bases along coastal areas now are maintained for this branch, so vital in anti-submarine patrol.



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These two types of trainers not only speed student transition to warplanes but set the engineering pace required to provide the tools of Victory. They reflect the "Touch of Tomorrow" that has marked every Fairchild engineering achievement for two decades—the "Touch of Tomorrow" that is today shaping things to come . . . next month, next year . . . from Fairchild drafting boards, laboratories and production lines.

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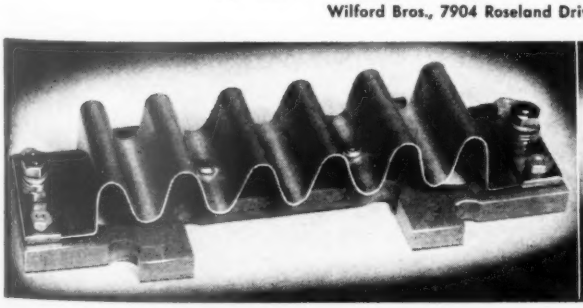

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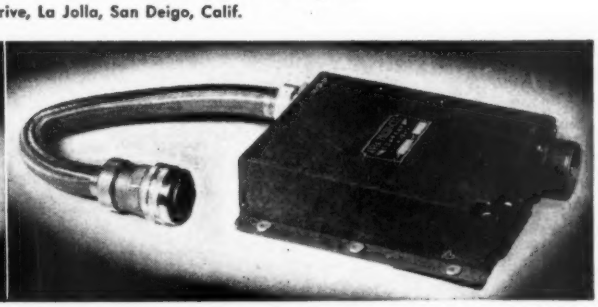

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(*Continued from page 266*)

the use of airplanes is impracticable.

If necessary critical materials were made available, large airships of both the plane-carrying and cargo-carrying types could rapidly be produced. In the last war the Germans worked up to a production rate of two Zeppelin ships per month. With modern production methods, we should be able to equal this rate, after plant facilities are provided and the necessary engineering and design work are accomplished.

END

Training Films

(*Continued from page 180*)

one of the major by-products of training film production. While teaching a subject in a film, the teacher is being taught how to teach.

Some of the subjects are comparatively simple. It is not difficult to show on the screen how to do fairly elementary operations. Mechanics must be taught how to handle basic tools. The teaching problem is not difficult here, but faced with a lack of trained instructors, and, more important, a lack of time, films are in increasing use.

Other problems can be handled only by motion pictures. If you were explaining how the retractable landing gear of an SNJ works, you might take your class to the hangar or the assembly line and show them an actual gear. But quarters are cramped, and only a fraction of the class can get a good look at the small parts. But a picture on a screen can show the apparatus from the best angle to as many men as you care to get into your classroom.

Some subjects can never be seen by the human eye. As one instructor told a camera crew, when they were talking of hydraulic systems, "Hydraulics are tough. When you take 'em apart, there's nothing there to see!" But the camera, through the use of animation, can go anywhere, through partitions, inside pressure cylinders, and see exactly what is happening.

Training film work must take advantage of all the characteristics of the screen. Many of the subjects translated into training films involve vast amounts of equipment, a great variety of weather and other conditions, enormous numbers of men, and integration of many military and Naval services. A film carefully made can compress such factors so that they can be studied intensively by small numbers of men. A film can present conditions and can analyze them in ways that an actual observer could never see for himself.

One of the fields which is becoming of increasing importance in this war is that of amphibious warfare. There are few manuals in this new type of fighting, and a great need for trained men. It involves the Navy, the Army and the Marines, with sea, air and land fighting. Maneuvers on this vast scale involve wide areas, time, and simultaneous operation in such a way that no observer, not even the admiral in a hand-picked spot, can see it all. But the screen can catch the massing in large perspectives, the details in close-ups, the patterns and plans in animation and diagrams.

Making such films, with the areas and the different services involved, is not always an easy job. Each scene must be planned well in advance, with a conference of all the officers involved. Each unit is assigned its part, and must know it thoroughly. With transports, destroyers and landing boats, with sailors, marines, engineers and signalmen, there can be no rehearsal. It must go right the first time. There is no chance to direct a scene in progress. Once started, it must roll on its way until the movement is completed.

Recently such a maneuver was being filmed. Everything was going according to the script, when suddenly, from behind some clouds, came a squadron of dive bombers. They saw landing maneuvers going on below them, and not knowing about the cameras, decided to get in some practice of their own. Ordinarily, if the men were going through regular training, this additional factor would help to make the training more realistic, and would be welcomed, if not actually scheduled in advance. But that day, the entrance of the planes ruined a carefully planned script. The director of the film could do nothing except sit back and swear. A megaphone is of no use in ordering a dive bomber to get out of the camera's range.

These films on amphibious warfare are proving useful in three ways. They are helping to cut down the time needed to train men. They are enabling the experts to study the maneuvers as a whole and improve tactical methods. And finally, they are establishing better liaison between the branches of our armed services, so that each knows the function of the other, and can act within the whole more efficiently.

Much of the exhilaration of the movie is its avoidance of indirection. The audience need not even crane its neck. Everything is shown in good light, right in front of your eyes. There is no straining to catch the event—it registers fully, completely. The right thing at the right time in the right place is shown for all to see. The meaning is clear, the mind is saved the task of arranging and judging and evaluating. The students in the auditorium literally see with expert eyes—an effect that the teacher can never give without the use of pictures.

The film can give a baptism of fire to hundreds of thousands of learners who never before in history could have gone into battle conditions with foreknowledge of the experience to come. The camera enables them to observe the operation in an atmosphere suited to study and learning. In actual maneuvers the sailor is too busy doing to do much thinking. He is distracted by his equipment, by weariness, by wetness and noise and discomfort. He gets just a small portion of the whole, seen through his own limited experience. In the auditorium, he can get a picture of the whole, with his share in the project detailed.

Of course, training films are not expected to be all of training. But in this

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END

Flight Training

(*Continued from page* 173)

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(*Continued from page* 134)

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END

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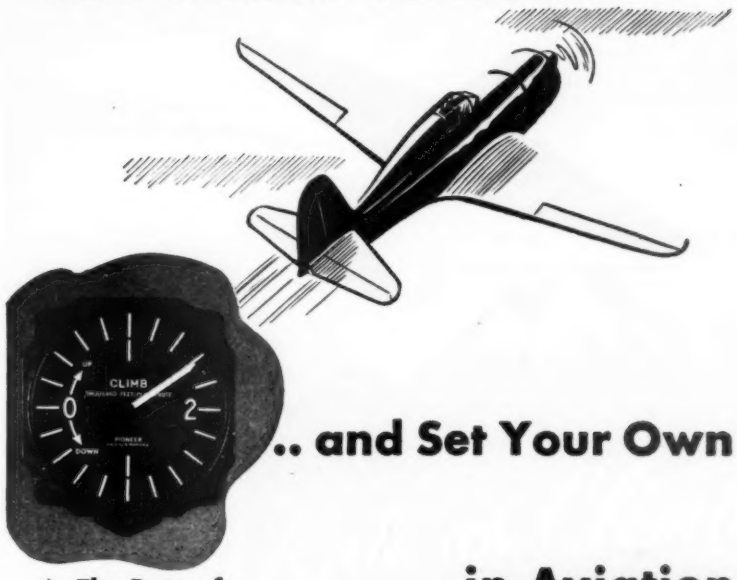

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Our Photographs

THE first photograph in the duotone portfolio (pages 119 to 126 inclusive) is appropriately entitled "Destroyer". The airplane is a Grumman *Avenger*, the Navy's torpedo bomber.

The striking photograph "Weatherman" shows a Navy enlisted man on the tower of the weather-recording unit at a Naval air station. The instruments shown are primarily for the recording of the velocity and direction of the wind.

"Torch Welder" shows a Naval aircraft welder at work on a piece of armor plate.

His airplane anchored off its ramp, the ground crewmen in "At Ease" take it easy until the next flight orders are posted. The airplane is an older scout-observation biplane, the Curtiss SOC. The Naval Aircraft Factory at Philadelphia built a number of these airplanes under license from Curtiss; they were designated Navy SON's.

Being rolled down its ramp to the water for a patrol flight, the *Kingfisher* in the photograph bearing that name now is used by Navy and Coast Guard both in the landplane and seaplane versions. Ground crewmen for planes of this type must wade into the water to launch or attach beaching gear to the floats. Hence they usually are seen clad only in swimming trunks.

One of the king pins of every Naval air station is the center of the picture "Aerologist"; he is the aerology officer, who tells airmen whether or not they will be able to fly that day. Here some fighter pilots check with him before taking off.

"Fire Fighters" is our name for them. The Navy usually calls them "Hot Papas" or "Asbestos Joe". They are the men aboard a carrier whose job it is to get pilots and aircrews out of planes crashed on the deck, in the shortest possible time. They walk directly into the hottest gasoline fires to rescue these flyers and are completely equipped with a set of tools with which they can cut their way through the heaviest part of any airplane.

"Carrier Landing" on the last page of this section is a striking action photograph of a *Dauntless* scout bomber just an instant before its landing hook engaged one of the carrier's arresting gear cables. During a carrier landing the pilot never takes his eyes off the crouching man in the foreground of our picture: the flight signal officer. This highly competent man is a veteran airman who can anticipate the results of any movement a landing airplane may make. With the signal "paddles" in his hands, he directs every move the landing pilot makes. Instead of watching the carrier, the pilot obeys the signal officer's paddles. When they are dropped to the officer's side in the manner shown in our photograph, the pilot knows he is "in the groove", cuts his throttle and lets his plane sink onto the arresting gear.

* * *

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(*Continued on page* 283)

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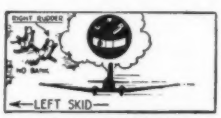

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The Scout Bomber

(*Continued from page 88*)

Using this as a measure of what a sea battle is, operations by Naval forces against the enemy's naval bases, even though no major naval opposition is encountered, are still sea battles. The bases are essential for the control of the sea.

Discussion of the results of scout bomber employment in the present war will naturally limit itself to actions between American and Japanese forces, since those two countries have employed aircraft carriers with carrier-based scout bombers to a much greater extent than any of the other nations engaged in the present world conflict. Since scout bombers are not the only type of aircraft carried on board these carriers, they were employed in conjunction with the other types carried, i. e., fighters and torpedo bombers.

Plane-guard destroyer was close at hand to rescue pilot and gunner of this scout bomber which made forced landing when fuel ran out. Men are visible in cockpits.

The six distinct operations previously mentioned in which scout bombers were employed against the enemy were the raids on the Marshall Islands, the raid on Wake Island, the raid on Marcus Island, the Battle of the Coral Sea, the Battle of Midway Islands and, finally, the action against the Solomon Islands, which still is in progress.

In the raid on the Marshall Islands, the scout bombers shared honors with the other carrier-based types. In this raid they inflicted great damage on the naval and air bases located on these islands. Runways were badly damaged by bombing and antiaircraft gun positions were destroyed or put out of action, hangars and supplies were bombed and burned, barracks were bombed and burned, aircraft on the ground were destroyed and enemy shipping in the harbor was destroyed—honors in the latter being shared with the torpedo bombers. Losses suffered by the enemy in this raid were severe enough to reduce very materially the threat to the Hawaiian Islands and the supply lines to Australia.

The raids on Wake Island and Marcus Island were very similar, though not so extensive by reason of the fact that they were lesser enemy bases. The result of these raids were the same as those on the Marshall Islands. There is evidence that the raid on Marcus Island had a very unhealthy effect on Japanese morale in the Japanese Empire proper.

In the Battle of Midway, the enemy massed the most powerful force he had yet sent out. Midway Island was the immediate objective, but from the size of the force—more than 80 vessels—it can be safely assumed that the ultimate objective was a much larger one, very probably the main Hawaiian Islands. Included in this force were aircraft carriers, battleships, cruisers, destroyers, supply vessels and many lesser craft. In this instance the honor of first sighting the enemy fell to larger, longer-range aircraft. This does not mean, however, that the scout bombers were not flown from our carriers on these daily scouting missions, for this is a daily routine of this type of airplane on board carriers.

At Midway, scout bombers employed as dive bombers were the first to "draw blood" from the enemy carriers. Land-based and flown by Marine Corps pilots, they attacked one Japanese carrier from which had been launched the planes that came to Midway on June 4th. While suffering heavy losses, these planes left their mark on one aircraft carrier and one battleship, and together with the Marine Corps fighter airplanes from Midway, caused the enemy to reverse course, presumably to reorganize before renewing the attack on the Islands. And then the scout bombers operating as dive bombers from our own carriers struck home. When darkness fell, the heart of the enemy force and the flower of their naval aviation was either beneath the waves of the Pacific or was flaming wreckage. Score for Midway was: four Japanese aircraft carriers, two cruisers, three destroyers sunk, and two battleships, four cruisers, one destroyer and four auxiliaries damaged. Here, to a very great extent, the enemy losses were the work of dive bombers.

The initial stage of the Battle of the Solomons was completed with a successful landing and seizure of the Guadalcanal air field by the Marines. No one knows the exact score of the first phase or since. Now it appears that the Japanese are making their long-expected, determined effort to retake these Islands. No one knows what the result will be in losses to the enemy in this phase. But one thing of which we may all be certain is that the scout bombers played a very important part in the seizure of the Solomons and are playing an equally important part in their defense.

END

The Coast Guard

(*Continued from page 116*)

of the crew of the *Sturtevant*. Immediately upon sighting the survivors, he attempted to communicate with shore. However, since he had no radioman aboard, he returned full throttle to a Navy base where he made his report so accurately that a rescue boat was immediately dispatched to the scene. He then refueled, took aboard a radioman and flew back to the scene of the sinking. He saw that the rescue boat was inadequate to pick up the survivors and sent for another rescue ship.

These are just a few incidents that point up the fact that CGA has managed to continue its rescues while at the same time fighting the war. There have also been many instances of bombing attacks against submarines, the exact number of which cannot be disclosed for military reasons.

In general it might be said that activities fall into three classifications: (1) patrol, (2) search, (3) convoy coverage. Before the outbreak of the war the main function of Coast Guard aircraft was that of patrol in the interests of safety at sea and law enforcement. Peacetime patrol, or even neutrality patrol for that matter, was a great deal less arduous than wartime patrol alone. Searching for an enemy submarine or a lifeboat of survivors from a torpedoed merchantman or providing an aerial umbrella for a convoy enlarges the horizon of duties. In addition, this valorous branch is still performing its former tasks. For instance, the Coast Guard air patrol on the

(*Continued on page 288*)

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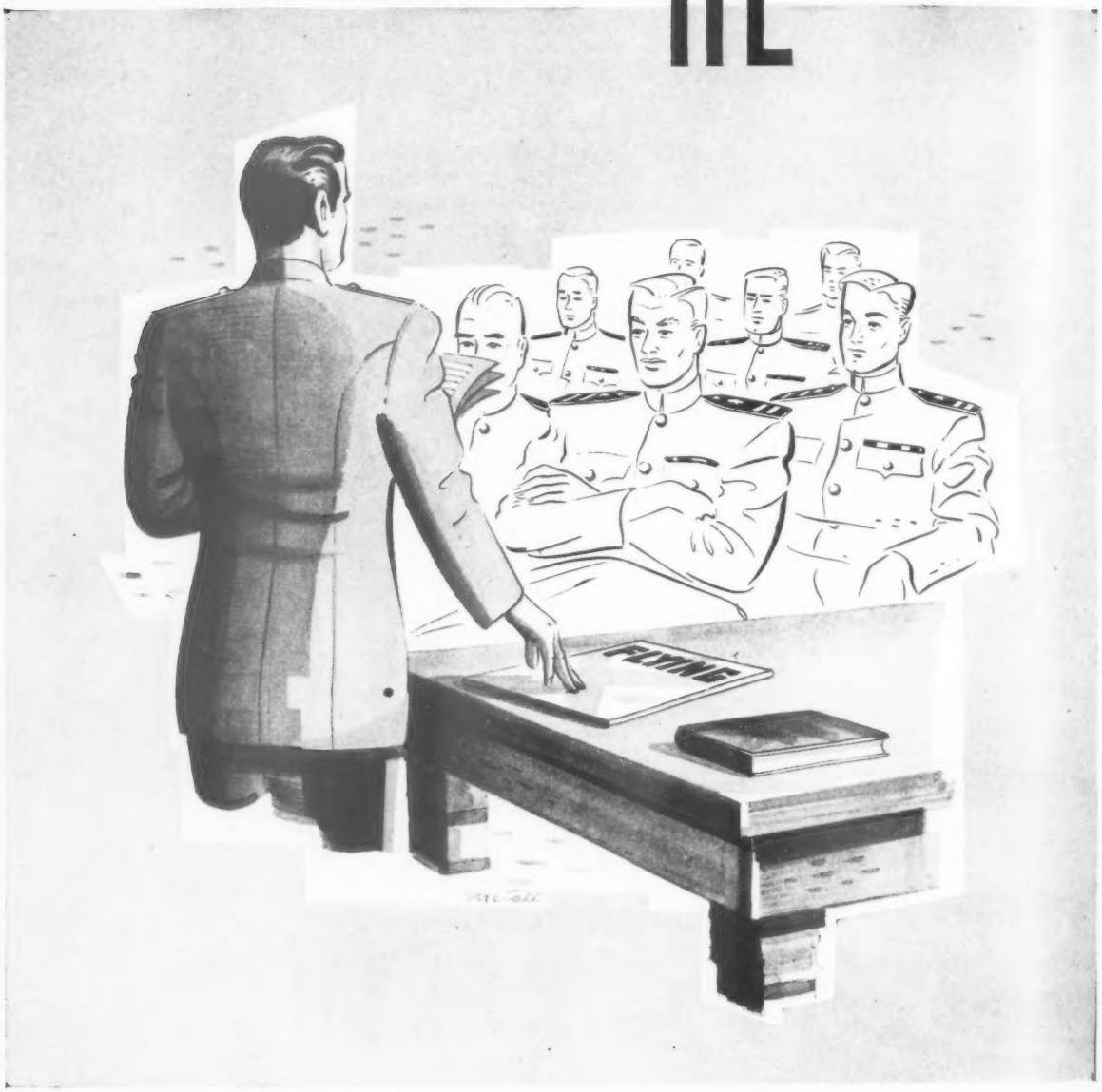

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Gliders

(*Continued from page* 110)

pilot as to his past services and achievements as pilot. A soldierly handshake.

"18th. This morning there was discussion about the operation with Ju-52 pilots, platoon (zug) leaders and Oberjaeger of the Parachute Troops. I am carrying men of Lieutenant Mohr's platoon, Sergeant Wein and his men. There is a hand-grenade thrower and a heavy machine gun as well as an automatic (m.p.) and other small arms and ammunition. I have now been told my landing place in Crete. It is an Army Air post with six guns by Suda Bay. Everything is clear. Now with a little luck the operation will be 100 per cent successful.

"19th. Extensive and feverish preparations for the operation. It is all too well known. This afternoon there was discussion on the attack once more. In the evening the parachute troopers came down to us on the flying field. I am quite calm. Tuesday morning at 0715 hours is to be the time of my landing on the Island of Crete.

"20th. Reville at 0300, for the start is at 0510. After a few contretemps we started at 0525. At the first attempt a lorry ran into my tow-rope; at the second the towing aircraft fell out of formation, but I managed to get away. So we flew for about 3½ hours towards the enemy. At 0825 hours I landed my machine on Crete. The landing field was very hilly and strewn with stones and rocks the size of a man. On landing, my glider was badly shattered, but my passengers were still able to fight. Things did not go so well with everybody."

It would seem that the functions of military gliders as indicated through their usage by the Germans would fall in the categories of special uses—such as in Belgium, freight and troop transport and as a component of the airborne forces. It's probably true also that the distances over which they have been used and will be used in the future on the European continent will be comparatively small. It should be noted that while they have not been used in any large force to date, all indications point to large quantities of gliders in the hands of the enemy, which quite possibly are being held for an airborne invasion of England.

The U.S. Navy is fully aware of the potentialities of military gliders. The development and production of amphibious types have been underway for well over a year. The possibilities of an amphibious glider are very interesting. Their use in amphibious warfare should introduce a new phase of military gliders used as a fighting weapon.

END

(*Continued from page* 276)

salon section, from pages 143 to 158.

"Color Guard" was taken aboard an aircraft carrier on patrol "somewhere in the Pacific". The photograph, looking aft, shows a Gruman *Avenger*, flaps lowered, about to take off. The carrier's wide wake shows that it has just turned into the wind so as to launch and land planes. Note the two planes to the far right approaching for a landing. The following destroyer is part of the carrier's regular guard.

The Navy's newest single-seat fighter is featured in "Looking For Trouble". Photographed at an East Coast Navy air base, the *Corsair* (F4U) fighter now is being delivered in numbers and soon will appear in all theaters of action.

"Leatherneck" is an unusual portrait of Maj. John L. Smith, ace fighter pilot of the Marines. Until recently, Major Smith was the leading ace of our armed forces, having shot down 19 Japs in the Solomons. His score has been surpassed since his return to the United States. He is shown seated in the cockpit of his *Wildcat* fighter.

"Ramp Clear" shows a *Kingfisher* scout-observation plane taxiing to its ramp under the direction of its ground crew chief. The wheels in the foreground are part of the beaching gear which the ground crewmen will wade out with, attach to the plane's main float and roll it up the ramp.

A Martin *Mariner* (PBM-3) is featured

(*Continued on page* 302)

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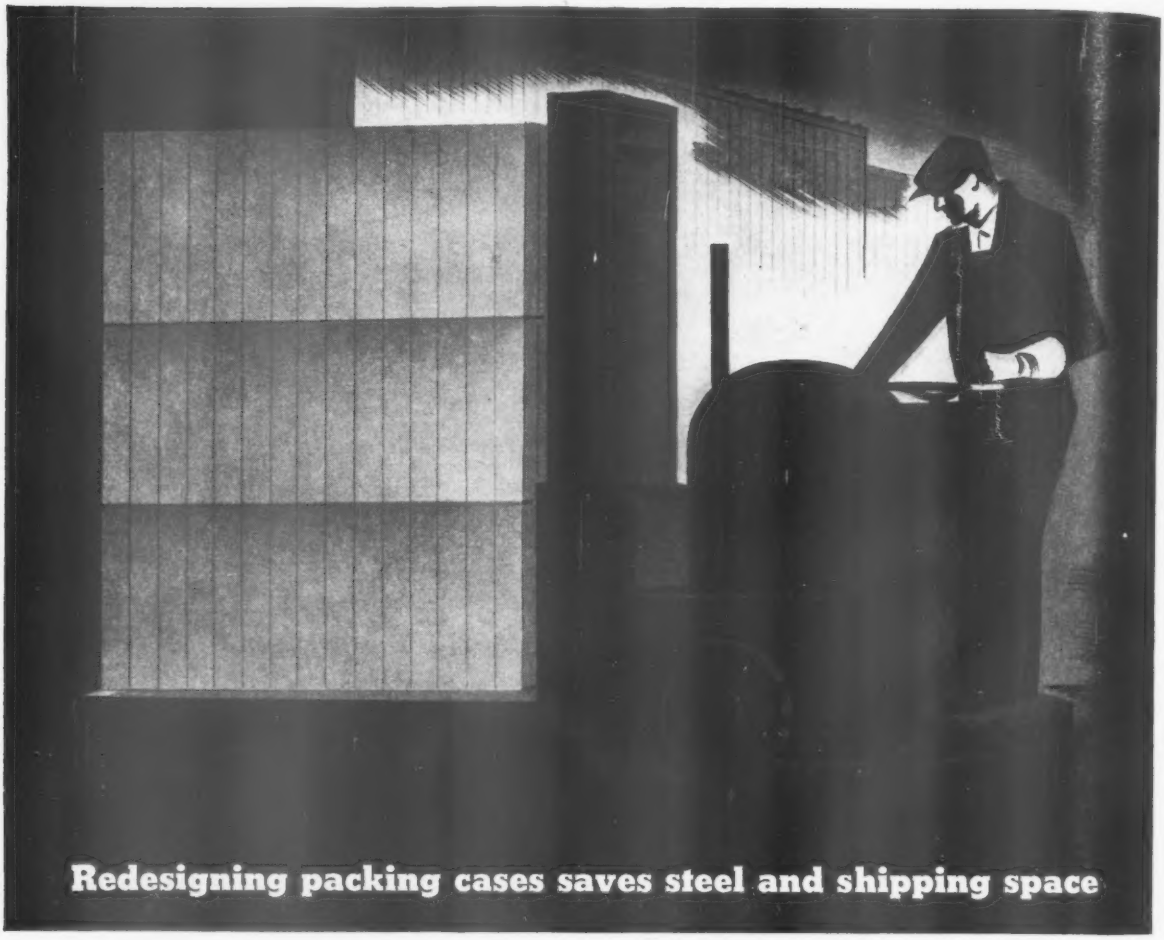

Redesigning packing cases saves steel and shipping space

Information supplied by an Industrial Publication

A case in point is what has recently been done by a large manufacturer of airplane engines with respect to a matter normally considered of small importance.

New packing cases have been designed which feature simplicity of construction, added strength and materials-conservation. Concerning the latter — an extremely important matter right now — it was found that the substitution of two thin metal bands for the former outside bolted steel strapping and lifting eyes has saved over 500 tons of steel annually.

A slight reduction in the overall dimensions of one size of case now permits 20 cases of this size to be packed inside a typical freight car, whereas only 10 could be so packed formerly. Countersunk case handles, and the elimination of other previously-used protruding hardware, offers a smoother exterior, more compact storage, and less likelihood of damage to adjacent cases.

Simplified design makes it possible for four basic cases to care for the shipment of all engine types, whereas eight were formerly needed.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS:
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MOLY

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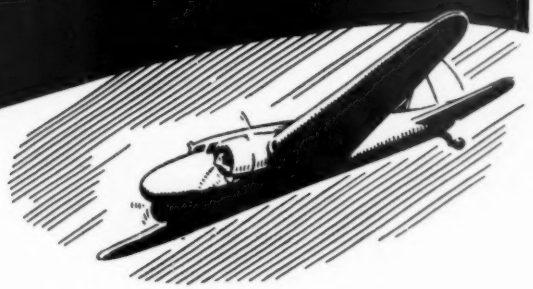

YES! Aircraft builders need trained men. . . .

Yes! Aviation demands skill and knowledge and trained intelligence.

But! U. S. aircraft manufacturers want, and want badly, key-men—not "bolters and nutters," who have to ask "where does this little bolt go, Bill?"—the type of men who, in the words of Svend Pedersen, Director of Education and Public Relations of the Lockheed Aircraft Corporation, "make up the backbone of such an organization"!

By what yardstick are these key-men measured at Lockheed? Four years' apprenticeship! There isn't any "zooming" into aircraft careers at Lockheed, or any other important aircraft plant!

There is just as much skill and knowledge and intelligence demanded of "aircraftsmen"—those men on whom rests one of the greatest responsibilities ever handed to industrial workers—as on the men who make up the backbone of any other industry.

There has been too much loose talk about "Aircraft Production Training Courses," and "Aircraftsmen Trained in Four Weeks," and "Zooming into an Aviation Career." We've got to be honest about this matter.

"Aircraftsmanship," the knowledge and skill that must predominate among aircraft workers, is not something to be obtained "overnight," or by reading a few short articles.

It is unfortunate that only those with a long connection with the aircraft industry appreciate the absolute necessity of special training of all aircraft personnel.

And here's how I. C. S. handles the problem:

I. C. S. has paid to specialists in the past three years $34,740 for the data only, from which training for Aircraft Mechanics and Aviators is provided . . . $6244 for one subject only—"The Aviation Engine"; $2552 for "Sheet Metal Work"; $2843 for "Measuring Instruments"; $1536 for "Aviation Engine Ignition."

That gives you an idea as to how "Specialists" do the job.

If you're looking for a "career" in aviation, if you're aiming to become a key-man in the aircraft industry, if your objective is more than to be a "cog" in the machine or a "number" on the assembly line, don't be mistaken: You've got your work cut out for you. You can't reach these objectives by any quicker process than have those select few who are the "backbone" of the industry today. They worked, they studied, and they studied from authoritative instructional data, and under the guidance of a competent faculty.

I. C. S. Training is designed and conducted to make these objectives possible. It is not an educational Irish stew . . . a conglomeration of unrelated facts. It is real . . . thorough . . . practical and approved by unquestionable acceptance.

If you're a man with a definite objective, in the Aviation Industry, we will be glad to send you the truth about a Career in Aviation. A letter or a post-card will bring you full information . . . or use the coupon.

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How to get into Aviation—Now

by C. S. (Casey) Jones

NO. 3 *in a series of advertisements describing the free training and opportunities now available in aviation. Addressed to the thousands of men and women who wish to prepare themselves for war service in this key industry.*

C. S. JONES

An architect drafting aircraft parts...a real estate salesman at a lathe...a housewife operating a drill...all over the country men and women are learning new skills, finding new interest and usefulness in the industry which is of first importance in winning the war.

Aircraft Manufacturing offers innumerable opportunities today—in training and in jobs. Requirements vary some, but in general men and women, married or single, 18 years of age up, U. S. citizens and not now employed in war industry are eligible. Free tuition and pay during the training period are offered.

• • • •

Companies building airplanes—such as Consolidated in San Diego, Curtiss-Wright in Buffalo, United Aircraft in East Hartford—are accepting applications from their respective localities for training courses of which the following are typical:

Pre-Factory Training: You become an employee of the plant and enter a selected vocational school for training in such skills as

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Application for Pre-Factory Training may be made to the employment office of your nearest aircraft plant. Information can also be obtained from the local office of the U.S. Employment Service.

C. S. Jones
President

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Training the Key Men of Tomorrow in Aviation

One Year

We have come a long way since Christmas 1941, all of us. American Amateurs have flocked to the colors — made themselves the backbone of the great Army Signal Corps and Navy Communications. Makers of Amateur equipment have put their entire effort into design and construction of Military communications units. For example, the Hallicrafters have, since Pearl Harbor, turned out production that would normally have taken seven years! ☆ We can all be proud that we have in one short year turned the tide of battle from almost unopposed conquest by the enemy to the first stages of the Victory drive on every front. And, let us all fervently hope that another wartime Christmas will be unnecessary.

W. J. Halligan

the hallicrafters co.
CHICAGO, U. S. A.

ARMY E NAVY

The Navy's Air Arm

(*Continued from page 47*)

That's only part of the record. Our planes have been in action elsewhere—the Solomons, the Aleutians and in many other places. Everywhere their record has been excellent. It will be far better before the war is over.

We cannot praise too highly the Navy pilots who flew those planes. Gunnery always has been of the highest importance to the American Navy. It is the big edge our ships have always held in action against the enemy—superiority in fire power. The men of the Naval air arm carry on that tradition. There are few Jap Zeros that have stood up against the blast of Navy guns and lived to tell the tale.

In this connection I might add that the "experts" who have criticized the Navy's planes for being under-gunned will be interested to learn that the Grumman *Wildcat* packs even more wallop than the famed English *Spitfire*.

This superiority does not exist in fighter planes alone. Our dive and torpedo bombers are the strongest and heaviest armed in the world. Their superiority in range and bomb load is the result of long years of experimentation—experimentation that began many years before the Stuka laid waste to a helpless Europe.

The accomplishments of Navy planes have emphasized the importance of a distinctive *Naval* air arm—both for planes and personnel. Each task assigned the aircraft of the Fleet demands the development of a type suited for its accomplishment. These specifications are predetermined by the Navy on the basis of reports drawn from the actual fighting fronts. Every attempt is made to develop planes suited for special work. These planes are *Navy* planes—born out of the experience of Naval warfare. In many important details of equipment, of armament and of basic design they frequently differ from their counterparts in shore-based aviation.

This emphasis on specific purposes applies as well to pilots as to planes. Our pilots are taught the ways of the sea. They are familiar with wind and weather and the moods of oceans. And first and foremost they are Naval tacticians, well-versed in every phase of fleet operations. They receive special training in dive and torpedo bombing—the Navy's own specialty—and hour after hour they study recognition problems so they will never make the tragic mistake of attacking their own warships.

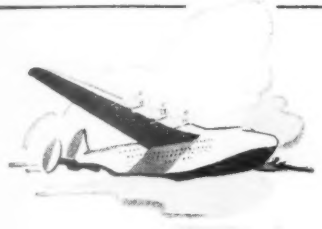
For both planes and pilots this specialization has paid big dividends both in successful attacks and defense of our own surface ships. Indeed, the record of the Navy's air arm is a record of study, of training, of superb tactics and flaming courage. It is a record that will stand against the exploits of any airmen in the world.

END

Security... AND THE AIRCRAFT INSTRUMENT TECHNICIAN

NATIONAL SECURITY

The bulwark of our defense — the spearhead of our offense — is air superiority. Chicago School of Aircraft Instruments has gladly given precedence over its civilian training to the War Program and has more than 500 men and women at all times, training for the Army Air Forces.



FLIGHT SECURITY

These Aircraft instrument specialists of the Army Air Forces are found wherever our planes are in operation . . . the men in the thick of things — the women in Civil Service at Army and Navy Repair Depots. That's how vital the proper functioning of aircraft instruments is to the flight safety and security of our "men with wings."

FUTURE SECURITY

Civilian Aviation needs aircraft instrument technicians, too — hundreds and hundreds of them. And though our first and biggest job is to train military forces, Chicago School of Aircraft Instruments has kept one class open for non-military students. This means only 15 civilian students each month can enter into training for this highly paid, specialized field of aviation. It is a grand opportunity for these 15 men to start a lifetime career with aviation manufacturers, passenger and freight air lines and Civil Service Maintained Aviation Maintenance Depots. Naturally, this small civilian class is usually filled many weeks ahead of time. So, write immediately for illustrated catalog and full details concerning classes, length of courses and terms.

Chicago **SCHOOL OF AIRCRAFT INSTRUMENTS**

2200 *Lawrence Avenue, Dept. F 2, Chicago, Ill.* • *Division of Industrial Training Institute*

(*Continued from page* 280)

Great Lakes, with its Grumman amphibian V-192, was active in reporting ice conditions on the Great Lakes to assist the ore carriers in the delivery of their strategic raw materials. Ice packs and storms are unaffected by Nazi aggressions, and the Coast Guard continues to fight the anti-social whims of nature. Planes are still attached to some of the larger cruising cutters.

Morale is high. Constant vigilance is the keynote. Hour after hour the pilot and his radioman will crane their necks from side to side in search of anything untoward until, eventually, they have completed their mission and their relief comes swooping down out of the skies wagging his wings. The pilot then dips his own wings in reply and heads straight for his station and chow, and is ready for another flight after a few hours rest.

We have seen how Coast Guard Aviation grew in the period between 1926 and the outbreak of hostilities. The pilots increased their number to 92 (as of December, 1941). Ground crews grew proportionately and in those fifteen years the number of airplanes increased tenfold. The nine air stations were so well built that they have been fully able to carry on all the new war duties the Coast Guard has assumed. Hangar space has proved adequate for the 100 per cent increase in planes of the last year.

To aid in the increase of personnel, a whole new program of training is now under way so that, by July of 1943, there will be 80 more commissioned Coast Guard aviators and 160 more enlisted aviation pilots. These aviation pilots are drawn from the enlisted ranks of the Coast Guard and are sent to Pensacola in groups of 20 in each monthly class. The only requirements for these young men are that they be under 27 years old and high school graduates, have their commanding officer's recommendation and be able to pass the flight physical examination. Young men having these qualifications are then selected by Headquarters for the next class at Pensacola. Designation as Coast Guard Aviator is now open to all officers of the Coast Guard, Reserve and Regular, who can meet the age and physical requirements for assignment to the Naval Air Station at Pensacola, Florida.

This inspirational branch of the service always sees action. In peacetime its less than 100 pilots earned among them five Distinguished Flying Crosses. And now in the thick of this war, aviation is an integral part of this action. As many men are now being enlisted in a month as were in the whole Coast Guard a little over a year ago, and some of these will become top-flight pilots. CGA shared the feelings of the rest of the Service when its commandant, Vice Adm. R. R. Waesche said, "We are proud to be part of the Navy in this war and eager to do well the tasks assigned us."

END

Aerology

(*Continued from page* 142)

there was we had dug out of apparently-forgotten government storehouses, in old Chinese temples. We found instruments from all over the world—French thermographs with no sheets, German barometers graduated in some queer scale, and Russian instruments nobody could read. However, all we wanted from the outlying stations was flying weather stuff—ceiling and visibility and local indications—and things worked out all right. We traveled from station to station, teaching the Chinese correct techniques and cloud types. Unless we made frequent visits they seemed to lose interest. We developed a system whereby each station would sound off with its report on the hour, like a U.S. teletype, and we got a reasonably good picture of weather all over this province.

"In February Richardson was killed. Fritzke had changed his job to armorer and was attached to the second squadron. That left Jourdan, one of the Army men, and myself. About this time I went to live in a little town 30 miles from a Jap air field in Indo China. There was a radio station there and the idea was to get weather information down in Jap-held Indo China by the grapevine so our planes would know when to attack the main enemy base at Nanoi. How we got

(*Continued on page* 294)

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We of Lewis regret the fact that in order to cooperate with the Navy fully we must sacrifice our entire civilian training program. But Victory must come first. It is a great honor and privilege to be chosen by the Navy for so vitally important a task in the defense of our country's safety and future.

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P. A. Feb. 1943

(*Continued from page* 288)

the information out is, of course, a military secret, but it will be an amazing story for after the war. It's safe to say however that what we got out made the Japs most unhappy.

"During the spring Jourdan and I were kept busy running up and down the road to different stations. We were both also working as radio operators. The enemy was getting strong. The Chinese army was disorganized and in full retreat except for a division opposing the Japs on the opposite side of the Salween. The Japs were using parachutists ahead of the Army and capturing strong points. At 3 a.m. on May 5 the Chinese army headquarters in Paoshan received word that the Jap armored force had broken through to a point 12 miles south of us and that many parachutists had been dropped in the nearby hills to take our radio stations. From then on it was every man for himself. We tried to load some gear on our Chevrolet truck and evacuate, but the congestion was so great it was impossible. So with tommy guns we shot up the radio transmitter and receiver and set fire to the other stuff. Then we caught a Chinese truck to a little town, where I stayed with one radio operator and set up a station on a small landing field. Jourdan and the rest went on farther to reorganize. The Jap army was stopped near Paoshan and stayed there.

"One of the radio and weather stations was later to become a very important outpost, for reasons now confidential. It served also as a refueling and operating base against the Jap motorized columns moving up the Burma Road. The Japs, of course, tried to eradicate the station by making several bombing and strafing raids, in one of which they made it very warm for me. In a 'jeep' I was inspecting bomb craters in the middle of a field one morning when nine hedge-hopping Zeros came in shooting. They ganged up on me, and I shoved the gas down to the floorboard and headed for the nearest ditch. I barely made it, but I wrecked the jeep.

"The 'Flying Tigers' were disbanded on July 4, 1942. We had signed contracts with the Chinese government for a year, which would have ended for most of us in October, but the U.S. Army had been wanting to take over for some time. We were given a choice—to try for commissions in the Army, or be paid off and honorably discharged. The Army brought in their own weather men before I left, but I don't know how they were organized. We dribbled back home, on our own initiative, a few at a time. Jourdan went to New Delhi, India, and was there when I last heard from him. Fritzke and I reached New York in September, 1942."

* * *

The foregoing account gives a pretty satisfactory picture of Navy aerology at work. The aerologist, a most important member of our service, is now doing an invaluable job all over the world. From Dutch Harbor to the Solomon Islands, from Norfolk to Casablanca, wherever the four winds blow—there you will find him, his weather eye open, guarding the Fleet.

END

Paratroops

(*Continued from page* 108)

He just had time to double up and throw his feet out in front to take the shock that appeared inevitable, when he noticed that the post was narrowly encircled (a six-foot radius when later measured) by a barbed-wire fence. As sometimes happens, due to freaky air currents, his 'chute spilled its air and dropped him flat—a three-point landing—head, heels and back. When he snapped out of the jolt he'd had, some men were running up to see if he was alive and he found that he was *inside* the barbed-wire fence, his feet just clear of the light post, and his head just clear of the barbed-wire.

Now we get into the final and most important part of a paratrooper's duties, the end toward which all the training, the hard work, the accidents, the amusing incidents, lead him—*combat!* The defeat and destruction of his country's enemies.

In order to do away with all worries about alien eyes and ears trying—and too often succeeding—in ferreting out what we are doing or intend to do, let's confine this part of our story to the uses our *enemies* have made of their paratroops.

The two general types of employment are, of course, sabotage and combat operations in conjunction with other forces. Of the two, sabotage has been the least employed. Small units are dropped in the rear of opposing forces for the purpose of wrecking important installations such as power plants, munitions factories, bridges. These paratroopers, in most cases, stand very little chance of ever getting away whether or not they succeed in their mission.

The uses for paratroopers in tactical

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operations are numerous, such as seizing certain airfields, river and canal bridges to prevent their destruction by retreating enemy forces, attacking a defended position from the rear, or a defensive area from the interior. In order for any of these uses to be effective, certain factors are always necessary. First of all, of course, a thorough and detailed reconnaissance in every form possible. Surprise is another prime requisite, but is also difficult to obtain, especially with a wide-awake enemy who is prepared for and familiar with the general type of attack preceding the dropping of parachute troops. At least temporary superiority in the air is a "must" for the duration of the drops in order that the paratroopers may not be annihilated, as they are extremely vulnerable from the time they step off to the moment they have landed, gathered their arms and had some chance to assemble. This period is very short, as the paratroopers jump from an average height of 300 feet.

In the case of seizure of an airfield, for instance, as was done in Holland, the paratroopers were preceded by a heavy bombing and strafing attack to disorganize and cripple the local defense. Protected by combat planes, the troops then came down, the heavier weapons, ammunition and equipment being dropped at the same time. As soon as the paratroopers landed, they freed themselves from the 'chutes, collected their arms from the dropped containers, assembled by small units and went into action to hold the field for reinforcements. These reinforcements followed almost immediately in the form of more heavily armed infantry being landed directly on the field by large transport planes. However, even with all the careful detailed preparations, the losses suffered by the paratroopers was heavy. Without them, though, those same airfields would have continued to function, with consequent delay and loss to the invading Nazi hordes.

Without question the paratrooper is invaluable, and as the present war progresses we will, no doubt, see increasing instances of his use to shorten and decide definitely some particular operation.

One thing for the layman to remember is that a paratrooper is practically helpless from the time he jumps until he has landed and is free of his parachute—just a few seconds, but every little bit counts. Before this war is over our Para-Marines will have a great deal to say for themselves. From the sky over enemy outposts all over the world the Marines will be landing and, as usual, taking matters well in hand.

END

Life-Saving Equipment

(*Continued from page* 188)

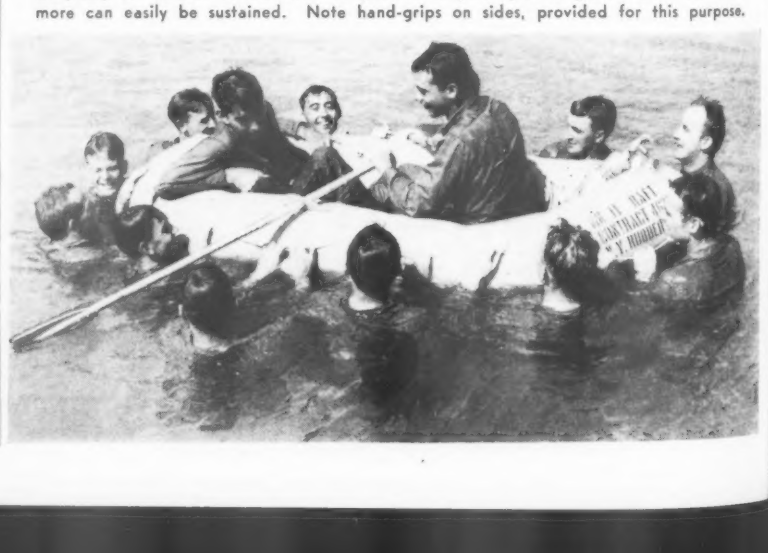
touched the surface of the water.

The inflation and immersion of the newest type automatic raft is controlled by an immersion switch, which requires no action on the part of the pilot. When the plane strikes the water, the action of the salt water on the switch closes a circuit which releases the raft compartment door and inflates the raft. This forces it out of the compartment. By the time the plane's crew has abandoned ship, the life raft is fully inflated and ready for use.

The most common kind of raft in use is the droppable type, so called because it can be dropped from an airplane in flight to persons swimming in the water. It is designed so that it will be fully inflated by the time it reaches the water. Inflation of this type of raft is accomplished by means of a pull on a T-shaped handle attached to the outside of the carrying case and connected to a carbon dioxide cylinder mounted on the raft. Many rescues have been effected with the use of this kind of raft.

For parachuting when a pilot is over the water a third type of raft has been developed. This is secured to the pilot at all times and is available after he has parachuted and landed in the water. It is similar to the one-man raft but slightly smaller. Its prime advantage lies in the fact that the wearer is provided with a life raft which is available under any condition which may arise.

Buoyancy of two-man rubber life raft (carried in planes) is so great that a dozen or more can easily be sustained. Note hand-grips on sides, provided for this purpose.



The Navy is proud of the way these rafts have performed under actual emergency conditions. The first outstanding example of their dependability was in April, 1931, when Chief Aviation Pilot V. W. Harshman became separated from his squadron because of engine trouble, while flying through heavy cloud formations over the Caribbean Sea. Harshman landed on the water and transferred to his life raft just before the plane sank. For five days he remained afloat on his raft until he was rescued.

Another dramatic use of a raft was the recent experience of Aviation Chief Machinist's Mate H. F. Dixon, who became lost during a patrol mission in the South Pacific and was forced down when his gasoline supply was exhausted. Dixon, his radioman, Aldrich, and bomber, Pastula, took to a raft and, after 34 days on the water, finally made their way to shore.

Ens. L. J. Meury and Radioman 3rd Class Richter were adrift on their life raft recently for 23 days after their plane was forced down at sea. They also made their way to shore.

Certain items of emergency equipment must be provided for each raft to sustain the occupants during the time they are afloat. Approximately 10 pounds of equipment per man is stowed in or near the raft. This includes food, water, a first aid kit, signalling devices, sail, fishing kit and a compass. Additions and substitutions are made from time to time as recommendations from the service are received.

The color of all exposed raft surfaces is orange-yellow. By test it has been found this color is the easiest to see against a water background, looking from either a ship at sea or an airplane in the air.

Life saving equipment for aircraft is considered an integral part of the airplane. As planes are improved and their operational qualifications bettered, so also must be the methods and equipment for safeguarding the lives of aviation personnel. With this in mind the Navy is directing every effort toward improving life saving equipment and developing new equipment which will help maintain the outstanding safety record already established.

END

Patrol Bomber

(*Continued from page* 96)

best they could. In the end, of course, they were overwhelmed. Many a story has been told of the resourcefulness of the Patrol Wing 10 officers and men. But again, as in the case of the golfer, you can't go around the course with one club and expect to beat an expert who has all the clubs.

The unfortunate experience of Patrol Wing 10 immediately aroused a loud clamor against seaplane patrol bombers. However, the realization has prevailed that both seaplanes and landplanes will have their uses in this war.

END

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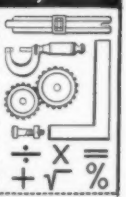

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Barrage Balloons

(Continued from page 113)

ing problem. One particularly still night they came out in numbers, and, encouraged by the lack of wind opposition, they attacked in numbers. A member of the crew living on the site, unable to sleep because of a perforated mosquito net, decided to walk around his balloon, a balloonet type. After his first turn he noticed the wind-scoop and decided that the ballonet was probably as mosquito-proof as any spot in the area, so he crawled in. Apparently he was correct in his assumption, for he immediately fell asleep. Early the following morning he was awakened by the voices of the balloon crew as they prepared to get the balloon off its bed and send it aloft. He practically shot out of the mouth of the wind-scoop just as the mooring lines were being cast off. Another five minutes of sound sleep and he probably would have spent the day aloft and the rest of his life in the brig.

Squadrons in the field are daily encountering new and difficult problems. One such unit, located in an area surrounded by dense jungle, lost balloons which were suddenly struck by thermal currents with velocities as high as 100 m.p.h. These currents, apparently originating in harmless-looking clouds, would force the balloons into short dives followed by terrific zooms. The answer to this problem is to have the balloons down when the current arrives, the only catch being that such currents give no warning. Balloons lost in this manner usually travel to altitudes where they are, of course, picked up by the prevailing winds at that particular level. Some of these can be followed and spotted when they start their descent, caused by a valving of gas at the high altitude. When the descent can be watched, the approximate landing spot is plotted and an expedition formed to regain the balloon. In this particular area, however, expeditions were also formed by the natives, and, if the searching party did not reach the balloon in short order, what was found was a large and tangled heap of rigging and small strips of balloon cloth. It was surprising to fly low over the area and notice the large number of previously thatched native huts coming out with shiny, new balloon cloth roofs.

An Army plane in one squadron area returned to its base and reported that flying low along the beach of his homeward trip, he had suddenly come upon a barrage balloon apparently secured on the

"Who's the clown that put the chocolate cream cakes in the bomb racks?"

beach, but still flying. The recovery trip involved a 40-mile sea voyage and a landing in some coral-fouled water. On reaching the beach, the recovery party found the balloon, as it had been reported, in excellent shape, flying on 10 feet of cable which had been very carefully secured to a large, buried stump. The balloon was deflated, rolled, and returned to the squadron but the thoughtful native who had so carefully secured the balloon was never found. He performed a valuable service.

Today, Marine barrage balloon squadrons are in the field with the combat units, now out of the defensive category and well into the offensive. The first Marine unit to leave the country after the declaration of war was a barrage balloon squadron—and they are still going out. The school has been moved to New River where its activities may be co-ordinated with those of the many other Marine units in training there. New equipment, new operating methods and new officers and men are being developed for the field. Before very long, the enemy will be finding his airplanes tangling up all over the world in a maze of barrage balloon cables —invited into a spider web by the United States Marines.

END

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Ground Crews

(*Continued from page* 130)

like hell that our gang's going to knock the guts out of every Jap ship in sight."

Most crews keep elaborate records—sometimes a large scoreboard in the wardroom—on their squadron's activities. There is a lot of good natured rivalry among ground crews; the ones whose pilots have the biggest scores at the moment are said, by some of the other crews, to be almost unendurably overbearing. A good many ground men walk around with their heads in the sky; occasionally they complain because they don't get into the air action, but now and then something happens to keep them pacified. For example, during the raid on the Marshall and Gilbert Islands, Bruno Peter Gaido, an aviation machinist's mate, third class, was delighted to see that a Jap pilot, his plane afire, was about to attempt a crash landing on the carrier Gaido was attached to. Gaido ran to a bomber parked on the flight deck, grabbed the free machine gun, and started shooting—something he'd been wanting to do for quite a while. He continued to shoot as the Jap plane came on in, and was shooting when it crashed into his, and was still at it when the Jap went on, encouraged by a stream of .50 caliber bullets, over the side. The Secretary of the Navy commended Gaido and advanced his rating to aviation machinist's mate, first class.

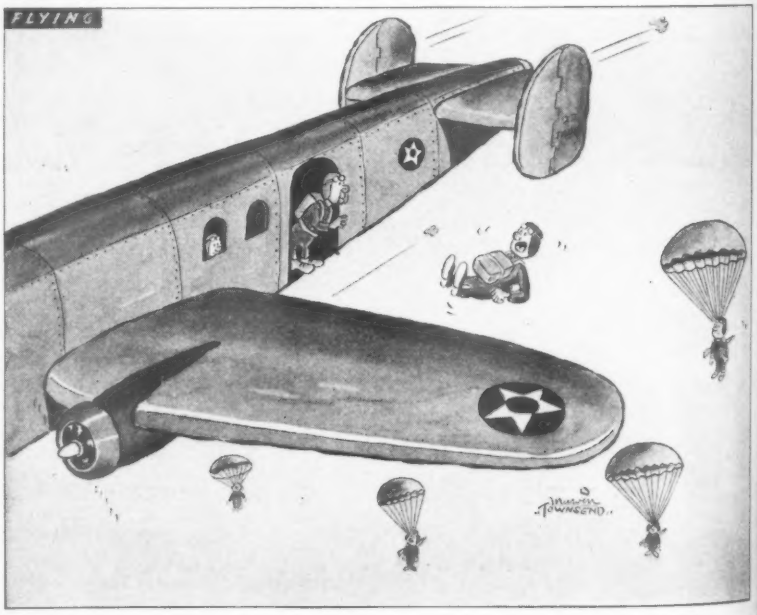
Again, on Christmas morning at Los Banos in the Philippines a ground crew man saw a satisfactory amount of action. The Japs came over and attacked the two PBY's based there. The only man aboard one of the planes was machinist's mate Roland Foster, who proved adequate to the situation. The Japs' opening burst ignited a mattress, so Foster rigged a bilge pump and went to work on that first. Then he looked to his guns. There were two waist guns and a bow gun. Foster went back and forth. First he would fire the bow gun, then he would take a turn at each of the waist guns, and then he would have a go at the bilge pump. In between times he reloaded and performed miscellaneous duties. When the planes were finally driven away, the other crew members and pilots came running up to see how Foster had made out. They found him, his plane riddled by 200 bullets, calmly working the bilge pump.

Ground crew men who get to be expert at both radio and gunnery often advance to flight crews. The ground alumni in their new flying jobs have acquitted themselves with distinction. Machinist's Mate C. J. Bannowsky, as a crew member of a big Navy bomber, was on patrol duty out of Java and ran headlong into a swarm of 12 Jap Zeros. The crew manned their guns, and the pilot put the ship into a quick dive. But the wing fabric, worn from continuous weeks of tough service, gave way and stripped off. When it was certain the ship was going to crash, some of the crew started bailing out. Bannowsky, however, seeing that the men at the guns wouldn't have time to make it, climbed into the pilot's seat and took over. With the Japs pumping a steady stream of lead at him, he put the damaged ship down on the water—right side up. A bullet got him in the back just as they struck. The men whose lives he had just saved got him out of the plane and onto a rubber life raft. Then, after the Japs had tired of trying to strafe them, they all got ashore . . .

Ground crew work is highly important, and it is interesting. Sometimes it is even a little dangerous.

END

"Must be gas on my stomach—
I'll just float around until I burp!"



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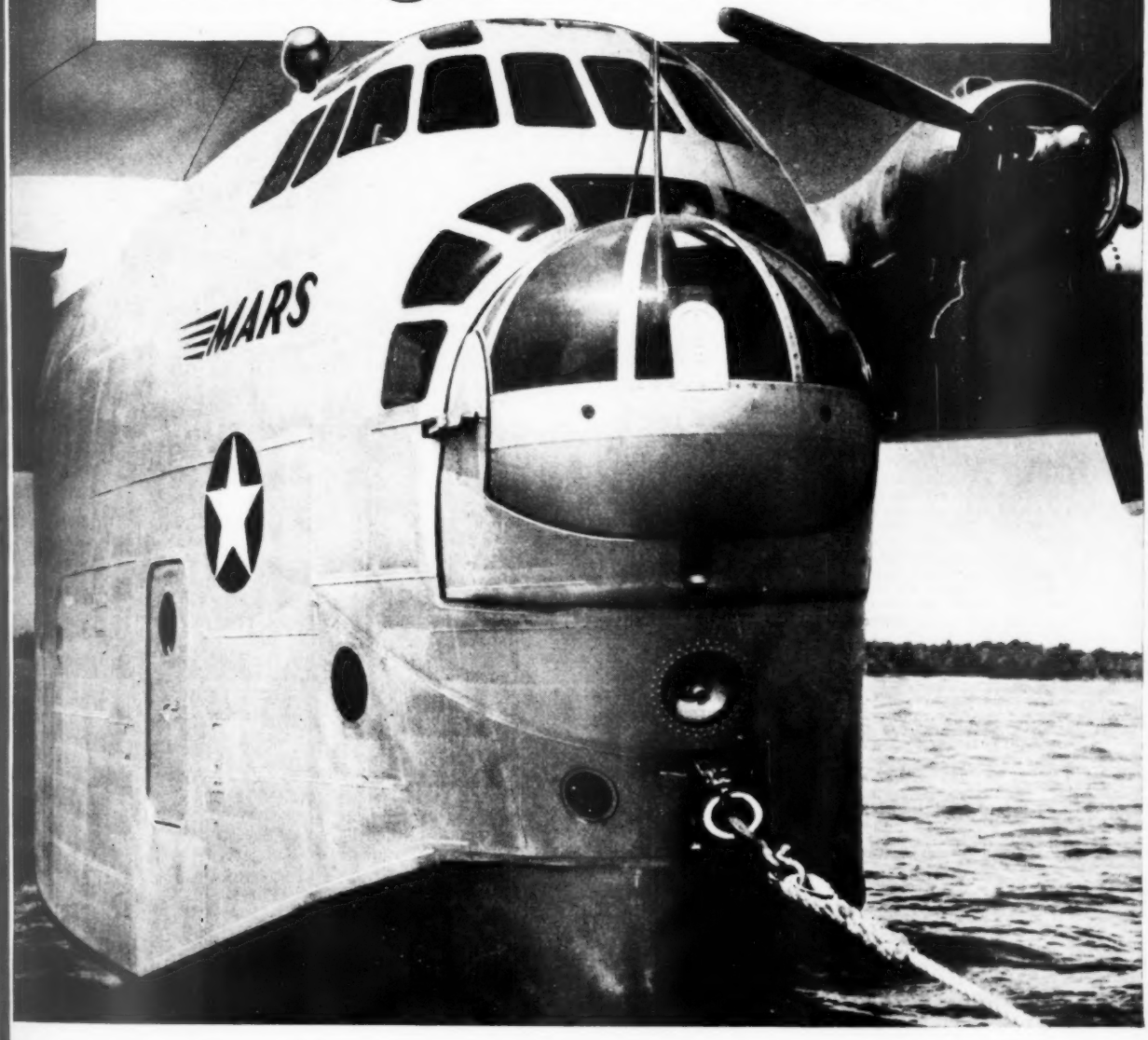

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(*Continued from page 283*)

in "At Anchor". Having just completed an afternoon's patrol of an Atlantic Coast area, the twin-engined patrol bomber has returned and is being made secure for the night by her ground crew. The *Mariner* is quickly recognized by its two large engine nacelles and the sharp dihedral in the horizontal tail surfaces.

The scout bombers in "Good Hunting" are Douglas *Dauntless* (SBD) dive bombers. Until quite recently, they have been the only dive bombers in the Navy. They have an amazingly fine record in every battle in which Naval aircraft have participated. The *Dauntless* is a two-place, low-wing monoplane and primarily was designed for carrier operations. The U. S. Army recently acquired a number of these aircraft, have designated them the A-24 or *Banshee*.

Pilots of a scout bombing squadron are congregated in front of the squadron assignment blackboard in "What's Cooking?", to see what their assignments for the day will be.

The Aviation Machinist's Mate in "Craftsman" is trimming and polishing a section of Plexiglas which is part of the cockpit canopy of a scout bomber.

"Gunsight" is an unusual photograph of a gunner peering through the sight of a flexible machine gun in a patrol bomber. The standard ring sight is in the foreground. Directly behind it is a square of bulletproof glass (from 1½ to three inches thick), mounted in a large piece of armor plate behind which the gunner crouches for protection.

After an afternoon's practice formation flying, the pilots in "Hangar Flying" were "caught" by the photographer discussing the day's happenings in the air.

"The Tower" is at one of the Navy's largest East Coast air bases. The heart of any big air base, the control tower, is in sole charge of all air traffic operating in or out of the field. The operator in the photograph is flashing the all-clear signal to an incoming Lockhead PBO-1, returning from a patrol flight out over the ocean. The PBO-1 is the Navy's designation for the airplane which is the same as the famed Lockheed *Hudson* of the Royal Air Force and the A-28 and A-29 of the U. S. Army Air Forces. Originally, this airplane was an airliner known as the *Zephyr*.

Patrolling an United Nations convoy somewhere in the Atlantic is a *Kingfisher* (OS2U) observation-scout operating from a Navy land base. This airplane is being used for this work both by the Navy and Coast Guard. Primarily, it was designed as a float seaplane for catapulting from battleships and cruisers. It is being augmented in the Navy by the new Curtiss *Seagull* (SO3C).

"Tin Fisherman" is an excellent ground view of a Gruman *Avenger* (TBF). This airplane, now the only torpedo bomber in combat use by the Navy, is an unusually large craft, as the photograph shows. It carries its large torpedo internally; the closed bomb doors inside which it is housed can be seen in the picture. The wings of the *Avenger*, a carrier-based aircraft, fold backward along the fuselage, turning sideways so that they lie flush alongside. This plane carries a crew of three: pilot, radioman-gunner and navigator-gunner.

The famed Grumman *Wildcat* is shown in "Fighter", with its pilot. A ground crewman is directing the pilot as he taxies out on the ramp for take-off. This is the airplane with which Navy and Marine airmen have whipped the Japs almost to a standstill.

The tough-looking pilot in "Dive Bomber" *is* tough. He has to be to do the kind of flying demanded of him. His airplane is a *Dauntless;* note the heavy armor plate behind the pilot's back.

The striking flight shot on the last page of this section is of five Grumman *Avengers*. In this picture the novel ball gun turret can be seen behind the pilot. *Avengers* first saw action in the Battle of Midway. They have replaced the older Douglas *Devastators* (TBD) with which the Navy started the war. The *Avenger* takes advantage of the lessons learned with the *Devastators*. END

Henderson Field, Guadalcanal Island, in the hands of the Marines. This strategic airport was wrested from the Japs. Note radio station, masts, on small elevation.

(*Continued from page* 261)

portant role at the moment, it might be worthwhile to give the Solomons a little more study.

Lying about 10° below the equator and 1,000 miles northeast of Australia, the islands are hot, humid, mosquito and fever-ridden and extremely verdant. The rivers are filled with crocodiles and the hillsides are crawling with large lizards. All the region is subject to sudden weather changes, bad rain and wind squalls often coming with no warning out of cloudless skies. The islands are chiefly volcanic in origin; some of the peaks reach heights of more than 8,000 feet. The natives of the Solomons and of most of the other islands of the Southwestern Pacific, are Melanesian; their racial characteristics differ widely from those of the Polynesians, who inhabit islands such as the Society and Marquesan groups farther east in the Pacific. Most Melanesians are jet black, have Negroid features, and an abundance of starchy black hair, which stands straight up on their heads. The natives of the Solomons are lazy but not unfriendly. Under the influence of the British most of their barbarous practices have been discontinued, although some cannibalism undoubtedly remains on a few of the smaller, less cultivated islands.

Guadalcanal, the island on which the hottest fighting is now in progress, is 80 miles in length east and west and has an average width of 25 miles. Toward its eastern side the island rises in high mountain masses, the peaks of which are generally enveloped in clouds. Mount Pompomanasiu, near the center of the southern coast, has been ascertained to be 8,005 feet high. The Kavo range, a few miles north of Mount Pompomanasiu and on the northern side of the valley known as the Ithina River Valley, is only a few hundred feet lower.

Being but 1,000 miles from Australia and even closer to New Guinea, the Japanese on Guadalcanal are easily within the striking distance of heavy bombers from the Australian continent and from other Allied bases in the area. Guadalcanal's importance lies in its central location with regard to other bases of the Southwestern Pacific. The side that controls it and its airport, Henderson Field, will in the long run control the whole region. It is imperative that we hold Guadalcanal, for one reason, to protect our supply lines to Australia, the disruption of which seems to be one of the main Japanese preoccupations just now.

Florida Island is the largest of a group lying about 13 miles north of Guadalcanal. It attains an elevation of about 1,366 feet and is well wooded, with occasional grassy tracts bare of trees. It is something of a contrast to the other islands, there being considerably more variety to its physical contour. Not only are there the usual sharp peaks among the mountains but also a sprinkling of pleasantly rounded green hills. Florida Island actually consists of two islands of a combined length of about 22 miles and separated by a narrow channel called Utuha Passage. A number of other small

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Comparative Ranks

RANKINGS of the Royal Air Force, listed below, should be used by the reader to clarify the status of RAF personnel with that of airmen of the U.S. air forces. The table below is correct in indicating the fact that a Marshal of the RAF technically outranks both the American general and admiral.

RAF	U.S.A.
Marshal of the RAF	General
Air Chief Marshal	Lieutenant General
Air Marshal	Major General
Air Vice-Marshal	Brigadier General
Air Commodore	Colonel
Group Captain	Lieutenant Colonel
Wing Commander	Major
Squadron Leader	Captain
Flight Lieutenant	1st Lieutenant
Flying Officer	2nd Lieutenant
Pilot Officer	

RAF	U.S.N.
Marshal of the RAF	Admiral
Air Chief Marshal	Vice Admiral
Air Marshal	Rear Admiral
Air Vice-Marshal	Commodore*
Air Commodore	Captain
Group Captain	Commander
Wing Commander	Lieut. Commander
Squadron Leader	Lieutenant
Flight Lieutenant	Lieutenant (jg)
Flying Officer	Ensign
Pilot Officer	

* Rank of commodore is no longer filled in the Navy. However, several commodores on the retired list possibly have been recalled to active service. The insigne is the full gold band of the rear admiral.

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islands, including Olevuga and Buena Vista, lie northwest of Florida Island. Between the eastern part of Florida and Guadalcanal there are numerous shoal patches and reefs. Three deep channels run through this stretch, namely: Ngola, Sealark and Lengo Channels. The island is well-populated. The villages are large and built chiefly on the slopes of hills.

Tulagi Harbor, the principal port and seat of government of the British Solomons, is situated about midway along the southern coast of Florida Island. It affords a secure anchorage in depths of 19 to 20 fathoms.

Gavutu and Tanambogo Islands, 148 and 121 feet high respectively, form the western side of Gavutu Harbor and are connected by a stone causeway. Both islands are covered with cocoanut trees. Mbangai Island, 156 feet high, lies 900 yards west of Tulagi and on a long reef. Makambo Island is also near Tulagi. Some of the other, larger islands are: Malaita, San Cristóbal, Choiseul, Gower, Buka, Santa Isabel, Vella Lavella, New Georgia and Bougainville.

The total area of the Solomon chain is 17,000 square miles. They were "discovered" by a Spanish navigator named Alvaro Mendaña. Anticipating that they were rich in natural resources, he somewhat prematurely named them the Islas de Salomon. They were lost sight of for a time, then, in 1768, Louis de Bougainville sailed through them, tarrying long enough to leave the imprint of his name on one of the largest of the group. Several other navigators and traders visited the islands in the next few decades, and a number of missionaries attempted to settle there and work among the natives. It proved to be a difficult project. The natives at that stage were unresponsive to the overtures of clerics. They were, in fact, downright vicious. Their eating habits, never very tidy, became more and more careless. Under the stimulus of extreme hunger they were likely to polish off a missionary or two. Mgr. Epaulle, a French priest who went to the Solomons in the middle 1800's, was killed by the natives soon after he had landed. As late as 1927, years after the British annexation of the group, there was an uprising of natives which resulted in the death of quite a few missionaries.

Today the natives are quiet and unbelligerent. As far as battling is concerned, their role has degenerated into that of spectator.

END

Nautical vs. Statute

AIRMEN joining the Navy must change at least one phase of their aeronautical thinking—and mistakes can be serious. If you have been accustomed to landing an airplane at, say, 60 m.p.h. and you land a Navy plane at an indicated speed of 60, you will have a difficult—and possibly dangerous—time, because the Navy aircraft actually would be landing at 68 m.p.h., the equivalent of 60 *knots* or nautical miles per hour. Conversely, a pilot switching from a Navy to, possibly, an Army plane should be doubly careful, especially in landing. If he is accustomed to landing a certain type of aircraft at 60 *knots*, the airspeed indicator in the non-Navy plane would mislead him into attempting to land at an actual speed of 52 knots. This discrepancy might well cause a stall and crash.

A knot is equal to 1.15 m.p.h. While the statute mile is 5,280 feet, the nautical mile is 6,080 feet.

Ships Are Planes . . .

AIRPLANES in the Navy are airplanes, aircraft or planes—but never ships. Newcomers to Naval aviation have several times made this mistake, sometimes with unpleasant results, according to Lieut. John R. Hoyt, author of the article on page 169 of this issue, who described an incident in a recent speech in Kansas City.

"It happened in the Battle of Midway", Lieutenant Hoyt said in describing the incident. "An ex-CPT pilot, then an ensign and a Naval Aviator, was patrolling in a PBY. Cruising over those lonely, deep blue seas, he saw nothing for hour after hour. Suddenly, some objects loomed up over the horizon and he became electrified. In that moment, old habits asserted themselves and, in his excitement, he picked up the microphone and yelled at the top of his voice:

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(*Continued on page* 307)

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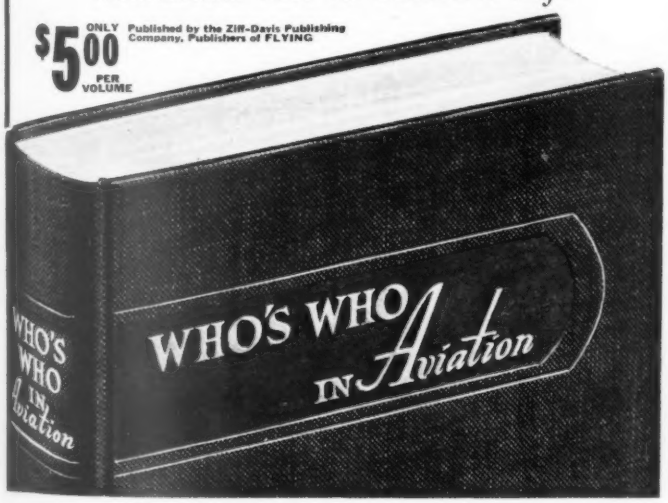

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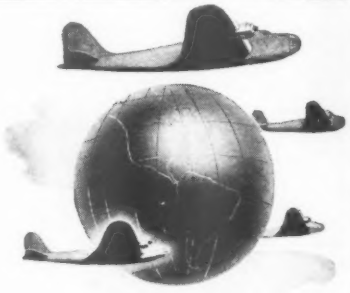

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(*Continued from page* 305)

SIGHTED . . . COURSE 90 DEGREES TRUE DISTANCE 150 . . . ' Then his radio faded out. The question was, what did he see? Seventeen what? Battleships, cruisers or airplanes? This lad had been trained in civilian flying, and just as I did for many years of civilian flying, called a plane a *ship*. It was a habit and he never broke it."

According to Lieutenant Hoyt, the Navy finally found out what he was talking about. But the mistake, if made often enough or under circumstances that didn't allow for interpretation, might lose the war for us.

The term "ship" for airplane is one of the most widely-used terms in aviation. It probably originated in the earliest days of aviation; every old-time flyer has used the term as far back as he can recall.

While the Navy's outlawing of the term for aircraft is well-founded, calling an airplane a ship still is acceptable in other circles. Army and civilian flyers still call them "ships," with the blessing of officialdom.

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AN engineering drafting board which cranks up and down like the window of an automobile is a new development of the engineering department of the Glenn L. Martin Company in Baltimore. Taking a load off the feet and stomachs of the men who have spent most of their lives standing or leaning over tables, the new board now seats them comfortably in swivel chairs.

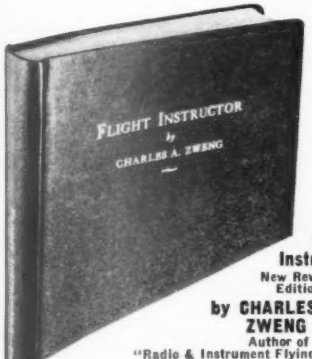
The development at Martin's was quite natural. The huge aircraft factories employ some 1,600 engineering employees who have suffered the discomforts of their profession, and now the 750 drafting tables in the engineering building, recently doubled in size, are being re-equipped with the device.

When not being used, the board lies flat on its desk-top. The draftsman, seated in his chair, twirls a small window-type crank which raises the board to the desired level. Then, by means of an horizontal bar, beneath the edge of the board, adjusts it to the proper angle. The board is kept in firm position by a "dog," controlled by the bar, which drops into a notched locking sector.

This streamlined, comfortable table was developed by a group of engineers headed by H. G. Klemm.

These tables are set in parallel rows so that the draftsman uses his own adjustable table for drawing and with but a half-turn of his chair has immediate use of the desk half behind him.

Draftsmen, who for many years endured the strain of being on their feet all day at the old tables, like the new invention.



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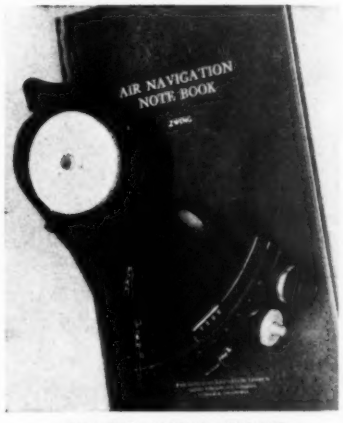

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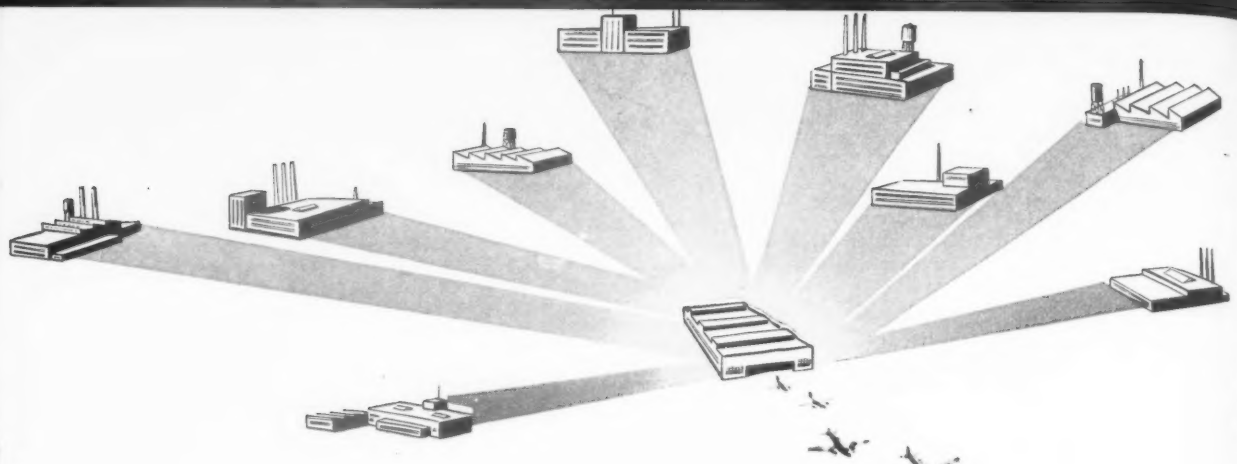

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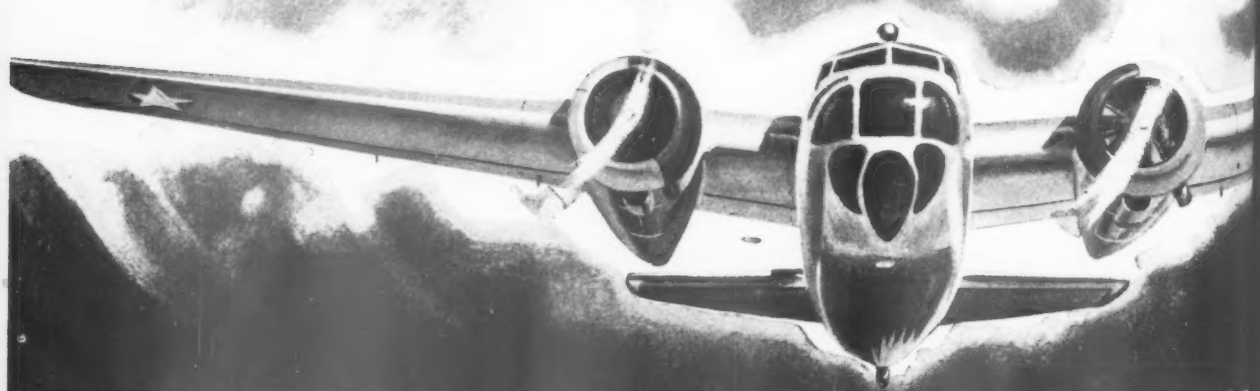

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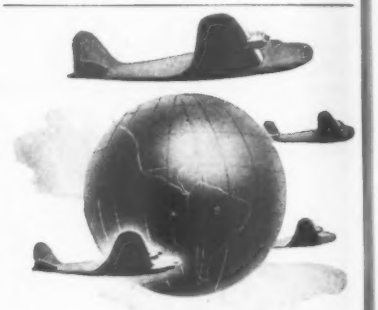
"Right Way" Corrigan

"YOU'RE going the right way now, Doug," declared Capt. John H. Comey, Army Air Forces representative, to Douglas Corrigan of "wrong way" transatlantic fame when the young flyer arrived at Long Beach, Calif., as co-pilot of a North American B-25.



The Voice of
AVIATION

Radio and Aviation have grown hand in hand — dependent on one another! Pioneers in both fields realized that successful aircraft operation, in peace or war, demands efficient *communications.* Frank Melville has given his time and energy to the development of Melville Aeronautical Radio School because he forsaw that the nation would need a dependable source of training men and women in radio communications for America's planes — first for Victory, then for Progress.

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45 West 45th Street New York City
Training Men & Women for Radio in the Service of
AIRLINES - ARMY - NAVY - MARINES - MERCHANT MARINE - COAST GUARD - INDUSTRY

(*Continued from page* 305)

SIGHTED . . . COURSE 90 DEGREES TRUE DISTANCE 150 . . . ' Then his radio faded out. The question was, what did he see? Seventeen what? Battleships, cruisers or airplanes? This lad had been trained in civilian flying, and just as I did for many years of civilian flying, called a plane a *ship*. It was a habit and he never broke it."

According to Lieutenant Hoyt, the Navy finally found out what he was talking about. But the mistake, if made often enough or under circumstances that didn't allow for interpretation, might lose the war for us.

The term "ship" for airplane is one of the most widely-used terms in aviation. It probably originated in the earliest days of aviation; every old-time flyer has used the term as far back as he can recall.

While the Navy's outlawing of the term for aircraft is well-founded, calling an airplane a ship still is acceptable in other circles. Army and civilian flyers still call them "ships," with the blessing of officialdom.

Drafting Board

AN engineering drafting board which cranks up and down like the window of an automobile is a new development of the engineering department of the Glenn L. Martin Company in Baltimore. Taking a load off the feet and stomachs of the men who have spent most of their lives standing or leaning over tables, the new board now seats them comfortably in swivel chairs.

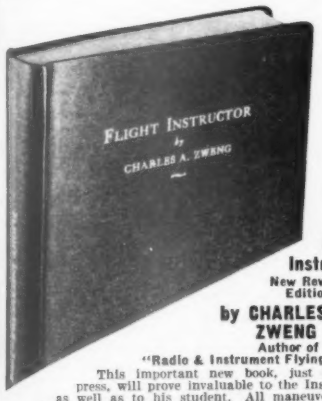
The development at Martin's was quite natural. The huge aircraft factories employ some 1,600 engineering employees who have suffered the discomforts of their profession, and now the 750 drafting tables in the engineering building, recently doubled in size, are being re-equipped with the device.

When not being used, the board lies flat on its desk-top. The draftsman, seated in his chair, twirls a small window-type crank which raises the board to the desired level. Then, by means of an horizontal bar, beneath the edge of the board, adjusts it to the proper angle. The board is kept in firm position by a "dog," controlled by the bar, which drops into a notched locking sector.

This streamlined, comfortable table was developed by a group of engineers headed by H. G. Klemm.

These tables are set in parallel rows so that the draftsman uses his own adjustable table for drawing and with but a half-turn of his chair has immediate use of the desk half behind him.

Draftsmen, who for many years endured the strain of being on their feet all day at the old tables, like the new invention.



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(AFFILIATE PAN AMERICAN NAVIGATION SERVICE)
offers the student

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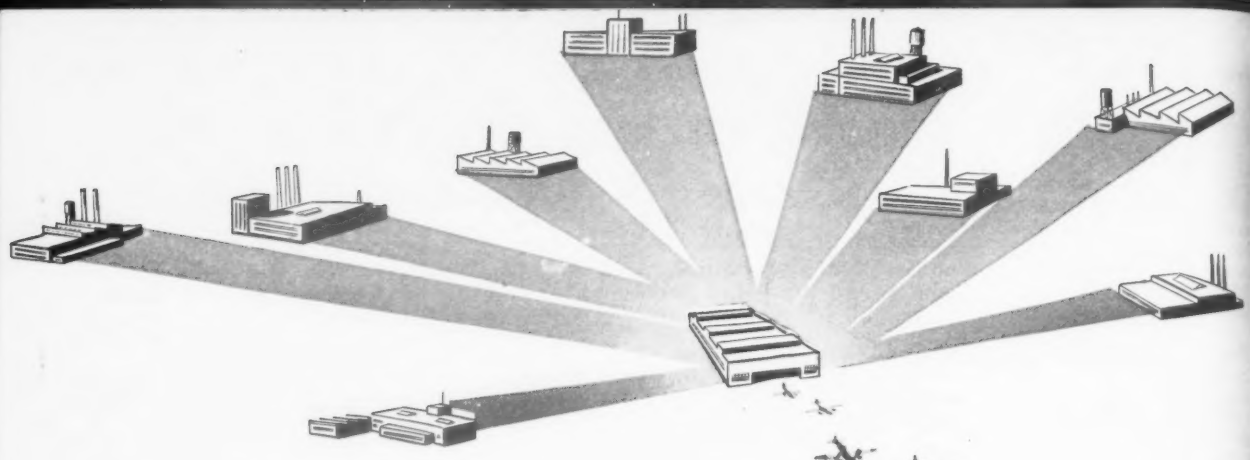

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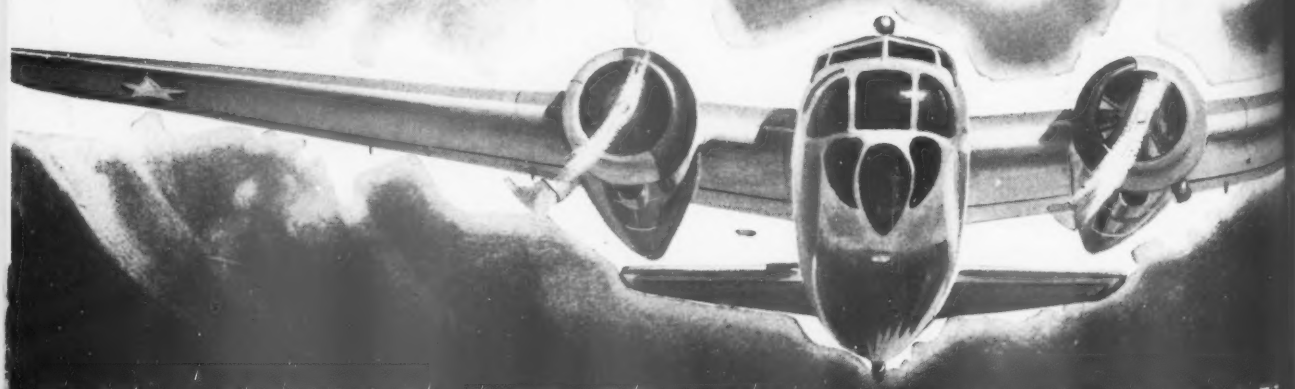
Meeting production schedules and delivery dates *exactly on time,* calls for careful, competent planning, for teamwork of the highest order. But it also calls for *capacity.*

One way to multiply the production of a prime contractor—to effectively increase his capacity—is to *spread the work.* For example, at McDonnell, on one airplane contract alone, 70 percent of the work is spread among 50 subcontractors in 8 neighboring states.

Such an arrangement not only *speeds* production, but also makes possible *expanded* production. That's why at McDonnell, we are not only completing present contracts *on time*—but are also in a position to handle *additional* production contracts.



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